NEPC, LLC

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# City of Hartford Municipal Employees' Retirement Fund

## Liquidity Study

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Kristin Finney-Cooke, CAIA, Senior Consultant
Doug Moseley, Partner
Will Forde, CAIA, Consultant

255 State Street, Boston, MA 02109 | TEL: 617.374.1300 | FAX: 617.374.1313 | www.nepc.com
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# Executive Summary

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- **MERF's current liquidity profile is healthy enough to meet benefit payments and commitments within the near future**
  - The plan is projected to have investment returns and contributions roughly offset benefit payments in the base case
  - Private (illiquid) investments are expected to provide excess returns above public markets to assist in achieving MERF's assumed rate of return

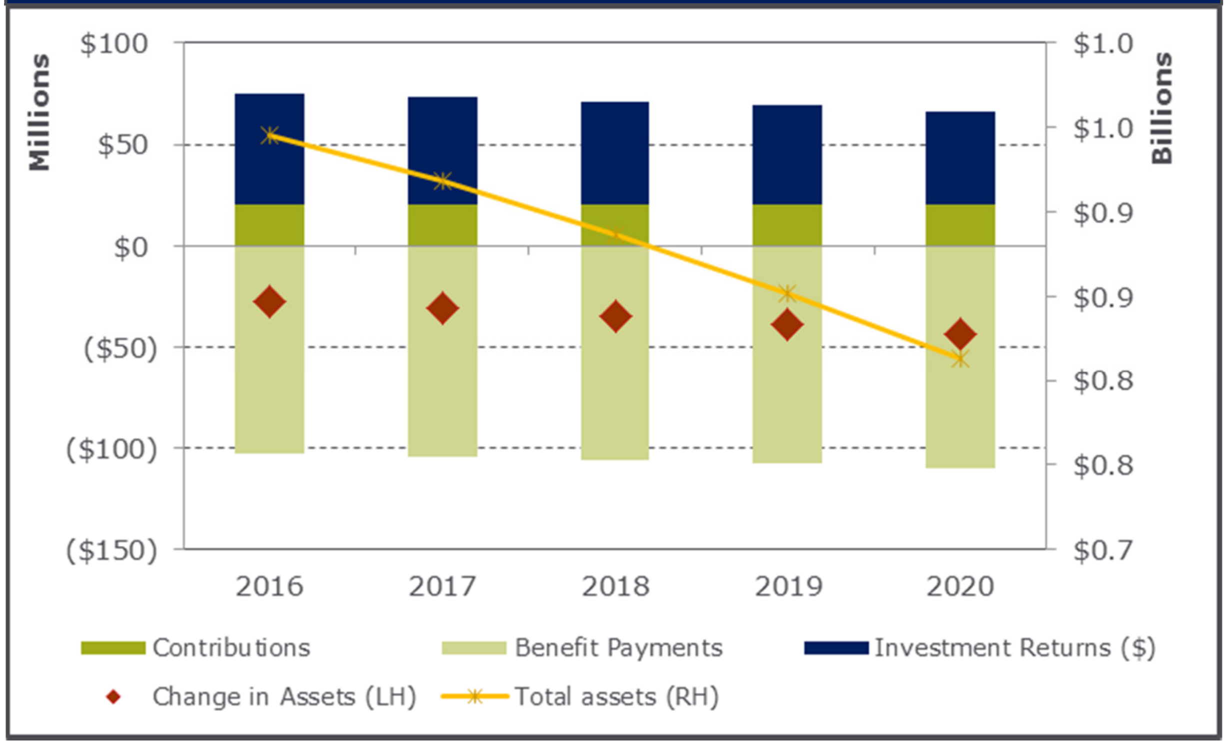
- **The liquidity profile and asset base of MERF changes considerably under the stressed case**
  - This is a direct result of a combination of negative investment returns and downward fluctuations in the contribution amount, which has historically averaged $50M
    - As a reminder, investment return is the most unpredictable part of the discussion while contributions are far more certain and controllable

- **Based on NEPC's analysis, there could be several negative impacts under a stressed case scenario**
  - Erosion of MERF's asset base as projected on page 5 and 6
  - Decline in funded status as projected on page 7
  - Significant change in the liquidity of MERF as projected on page 8

# Erosion of MERF's Asset Base – Sustained Low Contribution (Base Case)

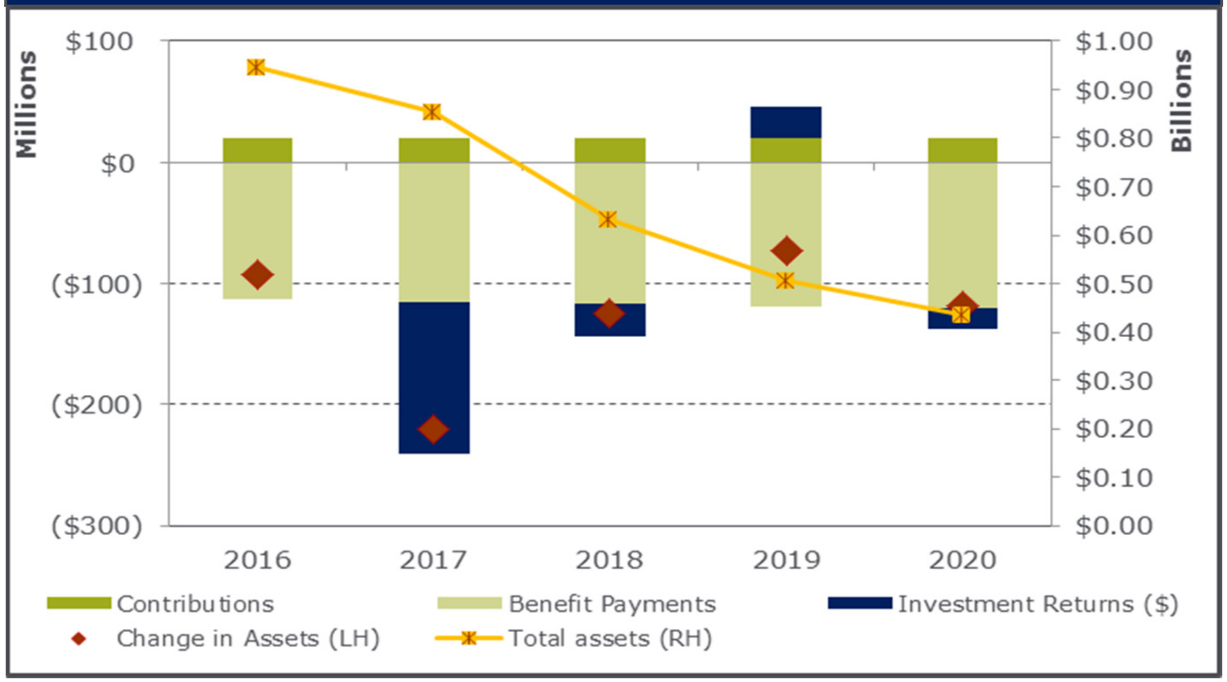
- **The below chart shows the decline in MERF's total asset value with a sustained low contribution ($20M/year) under a base case scenario**
  - Over the 5 year period, there is a projected $132 million decline in MERF's total asset value
  - NEPC's Base case scenario assumes a 6.4% return a year over the 5 year period

**Base Case – Sustained Low Contribution**

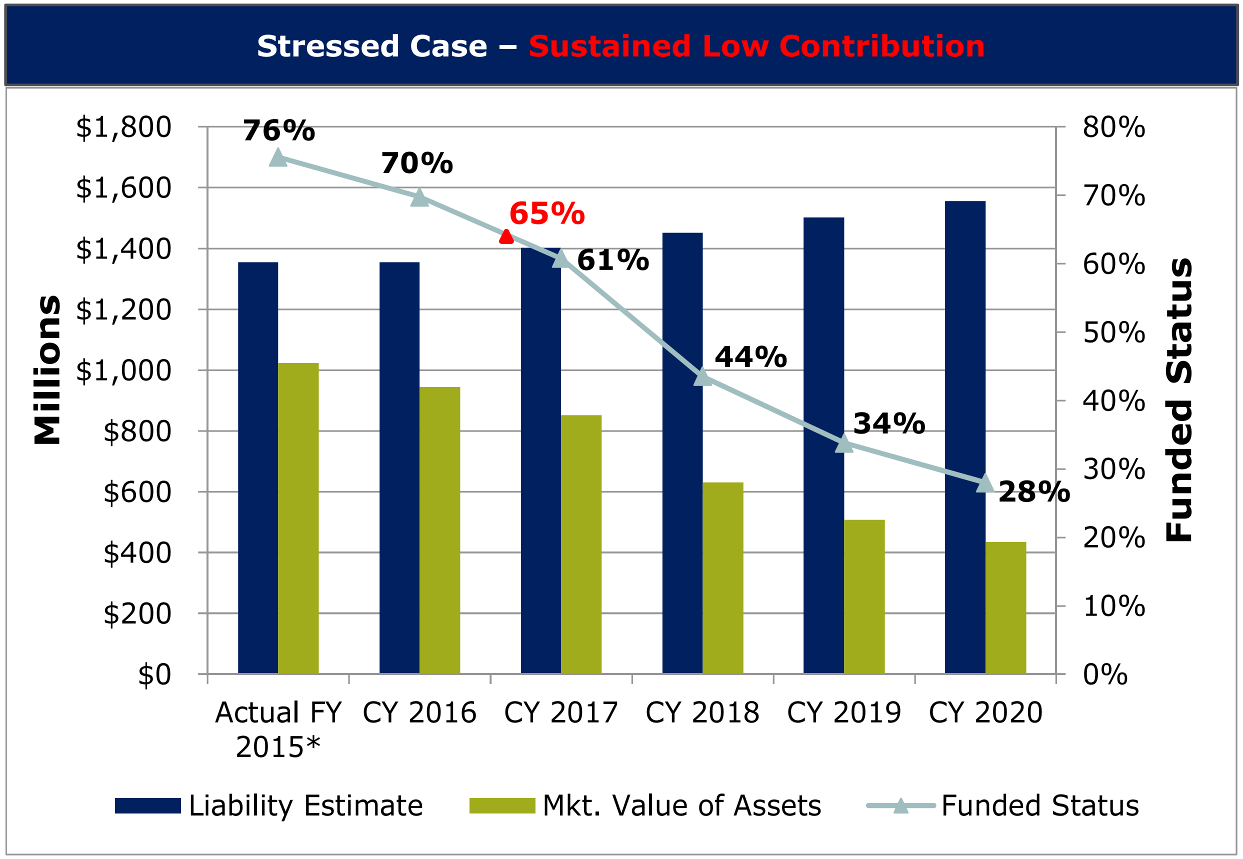


- **The below shows the decline in MERF’s total asset value with a sustained low contribution ($20M/year) under a stressed case scenario**
  - Over the 5 year period, there is a projected $510 million decline in MERF’s total asset value
  - NEPC’s Stressed case scenario assumes the below over the 5 year period
    - Yr 1: 0.0%, Yr 2: -16.6%, Yr 3: -5.1%, Yr 4: 6.2% Yr 5: -5.1%

**Stressed Case – Sustained Low Contribution**

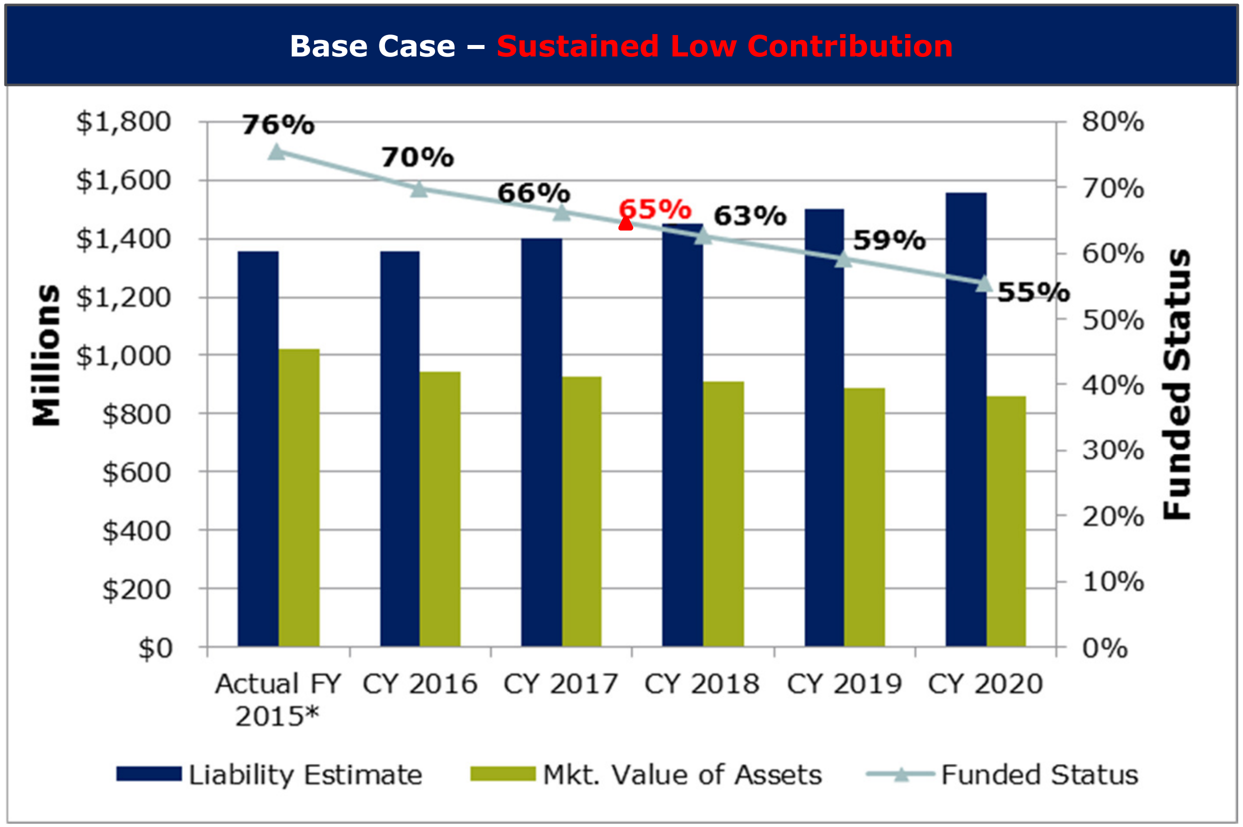


# Projected Decline in MERF's Funded Status – Stressed Case



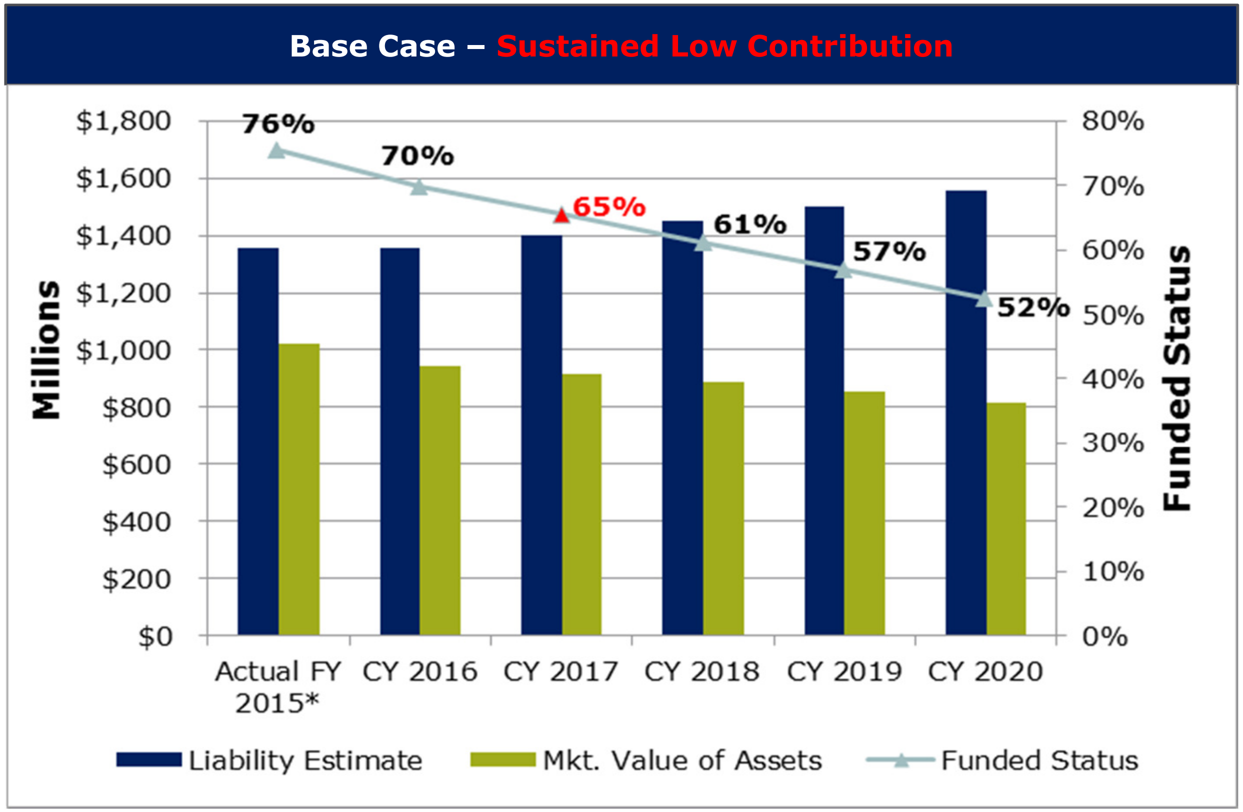

*FY 2015 is based on the actual mkt. value and liability amount provided by MERF's actuary; the growth rate used for the estimated liability amount is based on NEPC's inflation assumption of 3.5%

## Projected Decline in MERF's Funded Status – Base Case (assuming 7.75% return**)



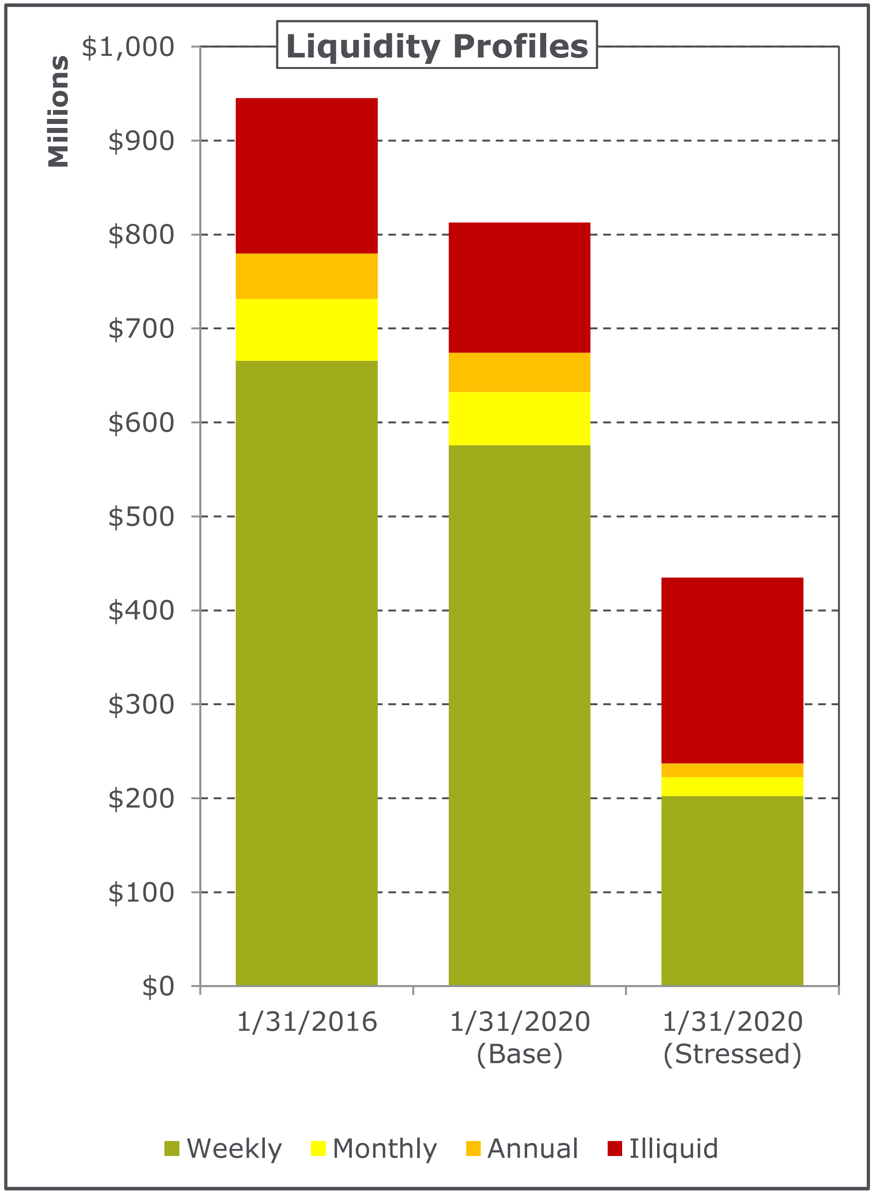

*FY 2015 is based on the actual mkt. value and liability amount provided by MERF's actuary; the growth rate used for the estimated liability amount is based on NEPC's inflation assumption of 3.5%
**The 7.75% is based on MERF's actuarial assumed rate of return

# Projected Decline in MERF's Funded Status – Base Case (assuming 6.48% return**)




*FY 2015 is based on the actual mkt. value and liability amount provided by MERF's actuary; the growth rate used for the estimated liability amount is based on NEPC's inflation assumption of 3.5%
**The 6.48% is based on MERF's expected 5-7 yr. return as developed by NEPC's 2016 asset class assumptions

## Liquidity Profile – Sustained Low Contribution Scenario




### The liquidity profile of MERF changes considerably under the stressed case

- MERF's Private (illiquid) investments become roughly 55% of the total Plan
- While the liquidity profile remains stable under the base case scenario, assets decline ~$175 million and the funded status drops from 76% to ~52%

### Divesting of private investments in hopes of improving liquidity, further widens the gap between the expected and actuarial rate of return

- Based on our 2016 asset class assumptions and the current policy targets, MERF's expected 5-7 yr. return is 6.5%

| | 2016 Target | AA (ex. Private Inv) |
|---|---|---|
| **Cash** | **1.5%** | **1.5%** |
| **Total Equity** | **32%** | **39%** |
| **Total Fixed Income** | **30.5%** | **37.5%** |
| **Total Alternatives** | **19%** | **0%** |
| Hedge Funds | 10% | 10% |
| Global Asset Allocation | 7% | 12% |
| **Total Other** | **17%** | **22%** |
| ***Expected Return (5-7 years)*** | ***6.48%*** | ***6.08%*** |
| ***Actuarial Rate of Return*** | ***7.75%*** | ***7.75%*** |
| ***Sharpe Ratio*** | ***0.45*** | ***0.41*** |
| ***$ Difference from Excluding Private Inv. (Over 5 years)*** | ***($19,016,918)*** | |

*Hedge Funds were excluded as private investments as their liquidity profile is stronger than other illiquid investments

# Liquidity Analysis Background

## Liquidity Analysis Background

- **Investment programs can benefit from a portion of assets in illiquid investments**
  - Capital calls on illiquid investments can be the foundation for future outperformance from real estate and private equity managers
  - Correlations can be low to publicly traded assets

- **Investing in illiquid assets, however, adds another dimension to liquidity management**
  - Will there be enough liquidity to manage future cash flows?
    - Will asset losses decrease total asset base to the extent that there is a liquidity problem?
    - What if capital is called more rapidly in the illiquid program?
  - Will there need to be forced sales of distressed assets?
    - Will assets believed to be liquid be less so when liquidity is most needed?

- **Liquidity analysis attempts to imagine a stressed scenario to see how the investment program would respond**

# Base Case Assumptions

- **Base Case: Investment Related Assumptions**
  - Returns: NEPC 5-7 year expected returns used
    - Total portfolio expected to return 6.4% per year
  - Commitments:
    - Private Debt, Real Estate, and Private Real Assets: Based on NEPC projections and recommendations
    - Private Equity: Based on projections from Pension Consulting Alliance
    - Average of $47M per year in total commitments
  - Capital Calls and Distributions: Based on standard industry averages
    - Capital calls average $40M per year
    - Distributions average $55M per year

- **Base Case Plan Specific Assumptions**
  - Benefit Payments: Based on actuarial data, average of $106M per year
  - Contributions: Three scenarios considered
    - **Normal contribution**: Estimate based on history and recent experience, $50M per year
    - **Low contribution**: $20M in year 1, $50M in years 2-5
    - **Sustained low contribution**: $20M in years 1-5
    - **Bell Curve contribution**: $5M year 1; $10M year 2; $15M year 3; $10M year 4; $5M year 5

- **Stressed Case: Investment Related Assumptions**
  - Returns:
    - Year 1: 0.0%
    - Year 2: -16.6% (-2 standard deviations)
    - Year 3: -5.1% (-1 standard deviation)
    - Year 4: 6.2% (expected return)
    - Year 5: -5.1% (-1 standard deviation)
  - Benefit Payments: 10% higher than base case
  - Commitments: Same as base case
  - Capital Calls and Distributions:
    - Same as base case except capital calls are doubled in Yr 2 and Yr 3 and distributions are halved in Yr 2 and Yr 3

- **Stressed Case: Plan Related Assumptions**
  - Contributions: Three scenarios considered same as the base case
    - **Normal contribution**: Estimate based on history and recent experience, $50M per year
    - **Low contribution**: $20M in year 1, $50M in years 2-5
    - **Sustained low contribution**: $20M in years 1-5
    - **Bell Curve contribution**: $5M year 1; $10M year 2; $15M year 3; $10M year 4; $5M year 5

# Asset Allocation Return and Risk Comparison

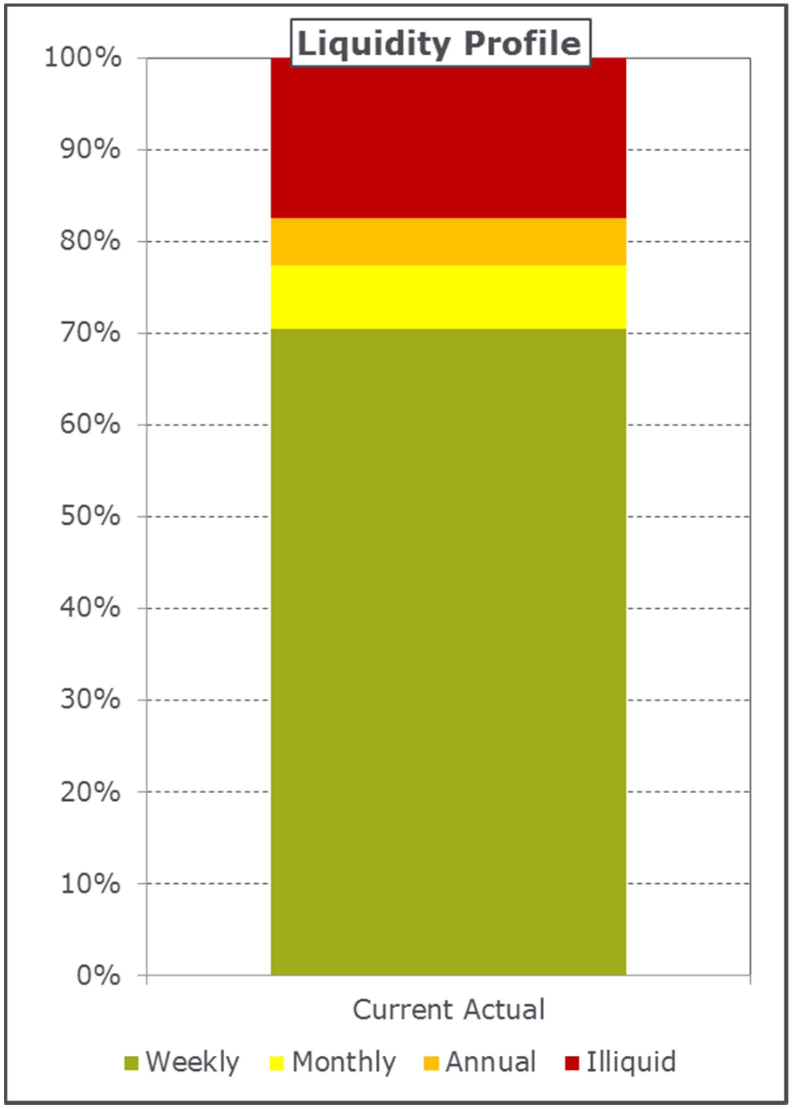
| | Current Allocation[1] | 2016 Target |
|---|---|---|
| **Cash** | **3.1%** | **1.5%** |
| Large Cap Equities | 12% | 10% |
| Small/Mid Cap Equities | 7% | 5% |
| Int'l Equities (Unhedged) | 11% | 11% |
| Emerging Int'l Equities | 5% | 6% |
| **Total Equity** | **36%** | **32%** |
| Core Bonds | 6% | 5% |
| High-Yield Bonds | 4% | 4% |
| Global Bonds (Unhedged) | 0% | 0% |
| EMD (Local Currency) | 7% | 6% |
| TIPS | 4% | 4% |
| Long Govt/Credit | 6% | 7% |
| Absolute Return Fixed Income | 5% | 5% |
| **Total Fixed Income** | **32%** | **31%** |
| Private Equity | 8% | 5% |
| Private Debt | 3% | 3% |
| Private Real Assets | 0% | 3% |
| Commodities | 0% | 0% |
| Real Estate (Core) | 6% | 8% |
| Hedge Funds | 5% | 10% |
| **Total Alternatives** | **22%** | **29%** |
| Global Asset Allocation | 7% | 7% |
| **Total Other** | **7%** | **7%** |

| | Current Allocation[1] | 2016 Target |
|---|---|---|
| ***Expected Return (5-7 years)*** | ***6.4%*** | ***6.5%*** |
| ***Expected Return (30 years)*** | ***7.4%*** | ***7.3%*** |
| ***Standard Dev.*** | ***11.5%*** | ***11.1%*** |
| ***Sharpe Ratio*** | ***0.43*** | ***0.45*** |

*1 as of 1/31/2016 * Totals may not add due to rounding*

# Current Liquidity Profile

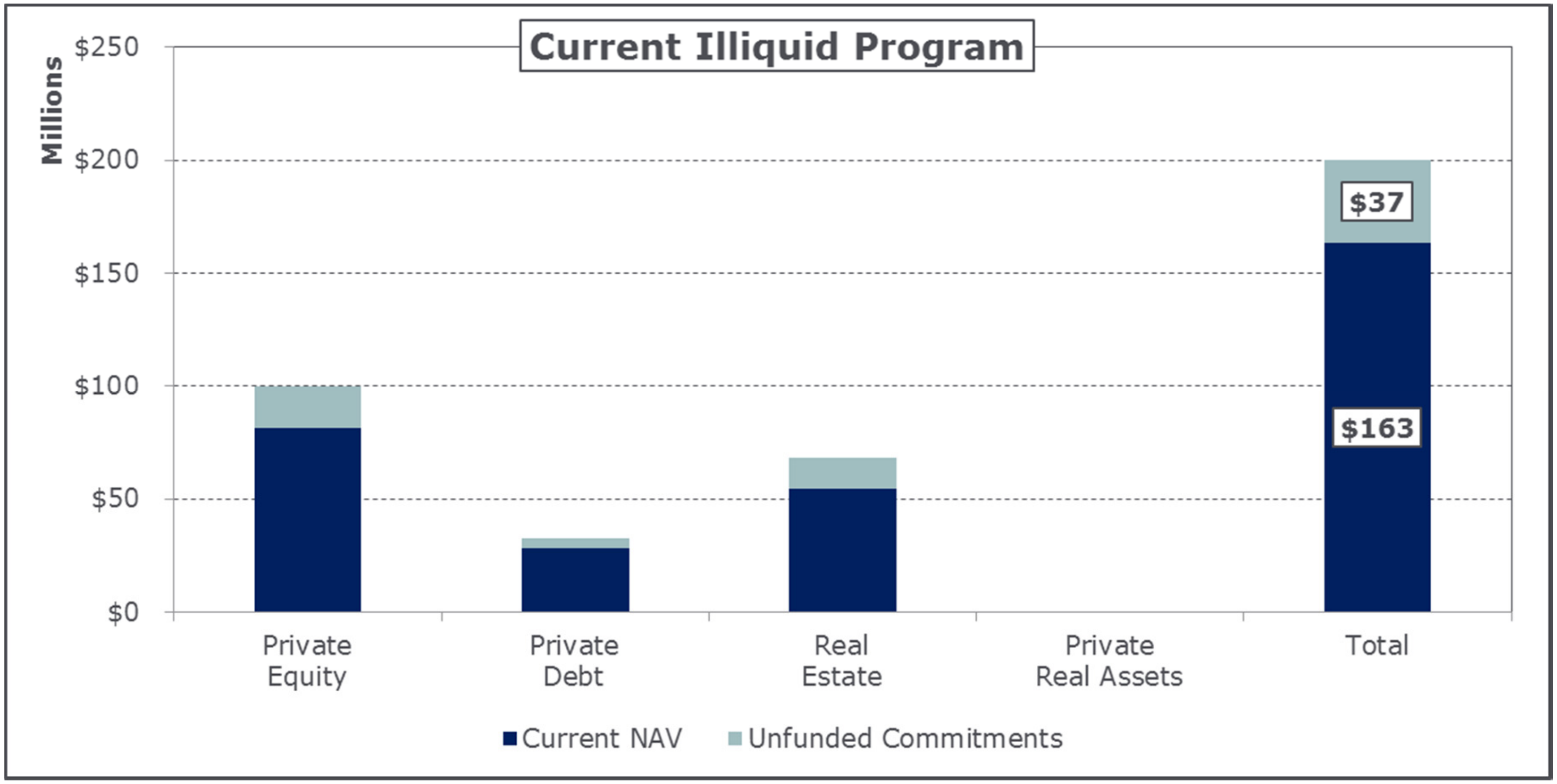
# Liquidity Profile – Current Actual




**Based on 1/31/2016 data*

- **77.4% of total assets are available on at least a monthly basis to meet regular liquidity needs**
  - Benefit payments and expenses
  - Rebalancing
  - Capital calls
- **Additional 5.1% of assets available on at least an annual basis**
  - Can be part of planned rebalancing but much less reliable for regular liquidity needs
- **Remaining 17.5% of assets are relatively illiquid**
  - Intermittent distributions - hard to plan around
  - Could be sold in secondary markets, but likely at steep discount

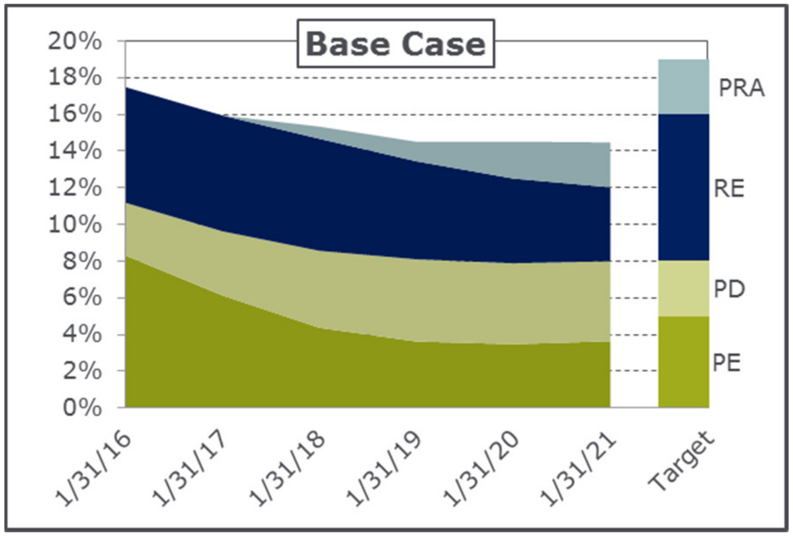
# Illiquid Program – Current Actual

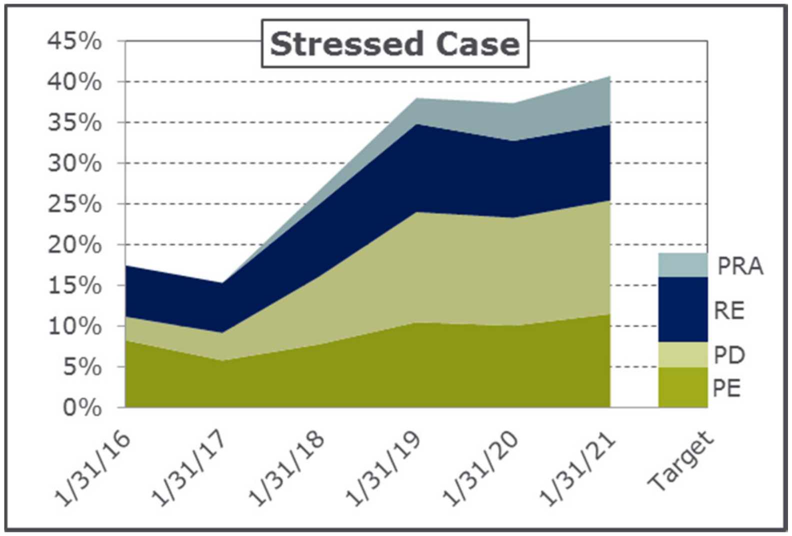



- **Because of uncalled capital commitments the allocation to illiquid investments can rise even without any additional commitments**
  - ≈$37M in uncalled private market commitments

# Normal Contribution Scenario

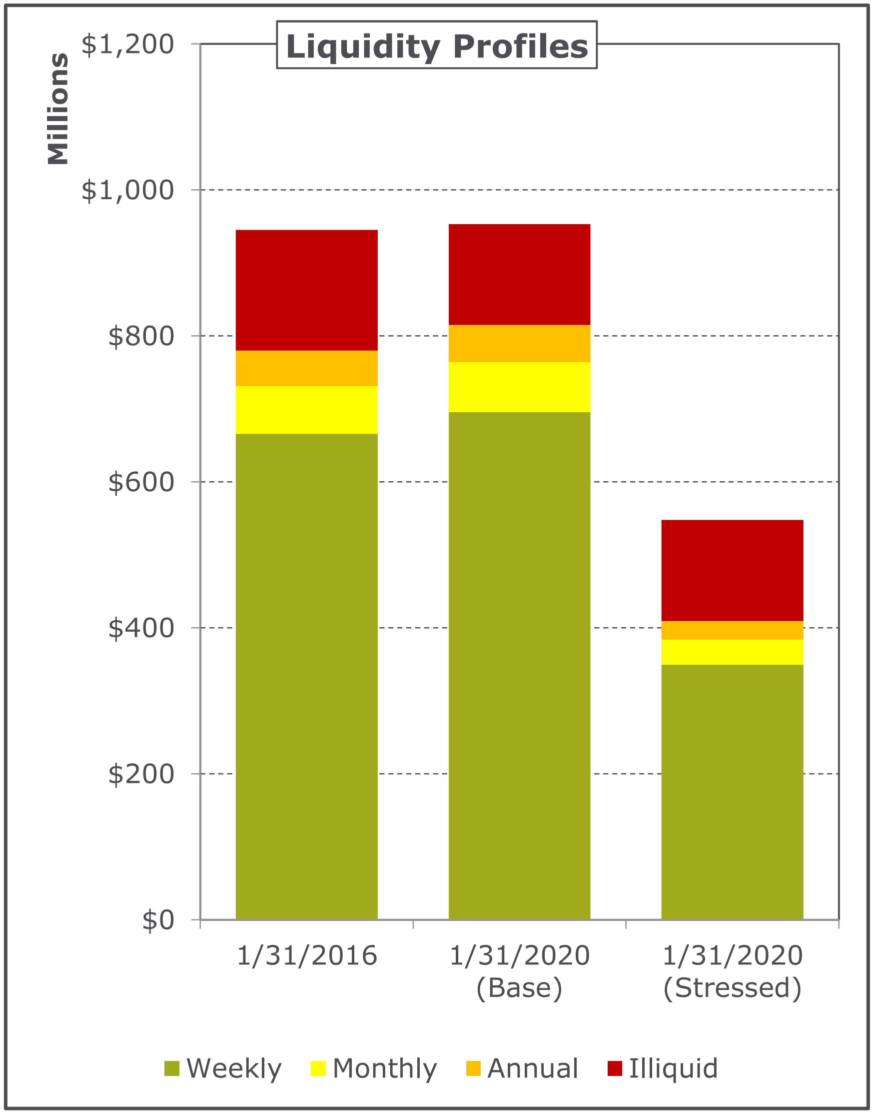
## Allocation to Illiquid Assets – Normal Contribution Scenario

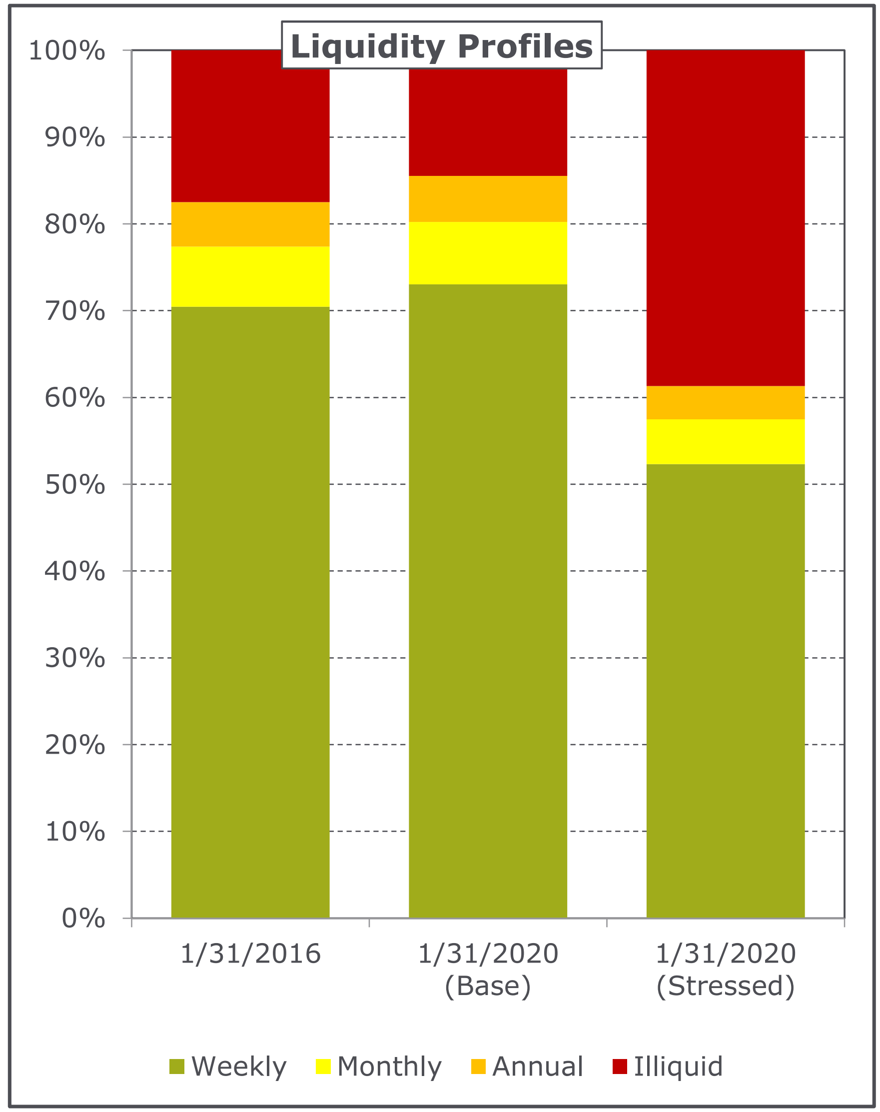


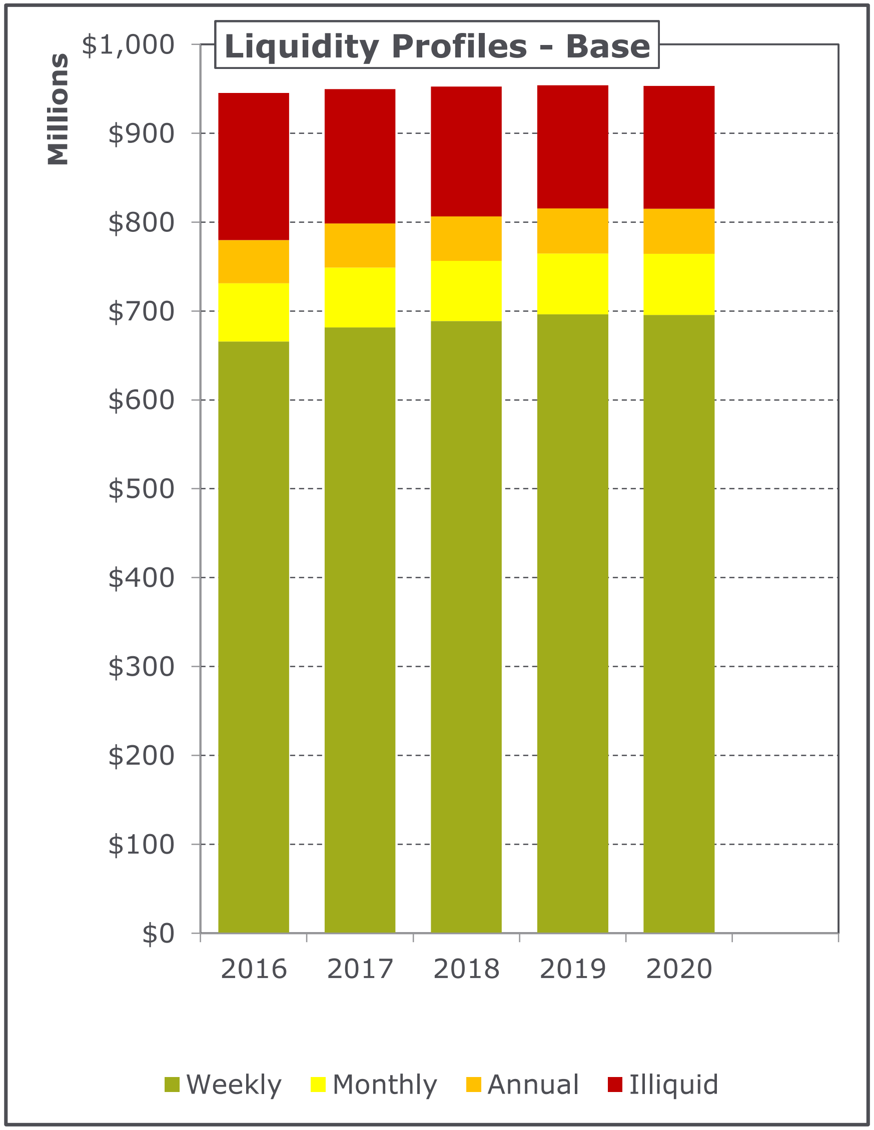

- **Expected future commitments keep allocations close but generally under targets in the base case**
  - Opportunity to allocate additional capital opportunistically to achieve targets
- **In the stressed case an increase in capital calls and a reduction in distributions combine with negative asset returns (denominator effect) to raise allocations to private markets well above targets**
  - Slowing the pace of future commitments could help mitigate this issue
  - Rise in illiquid allocation on a percentage basis is compounded by large cash flow imbalance (roughly $72M per year in stressed case)

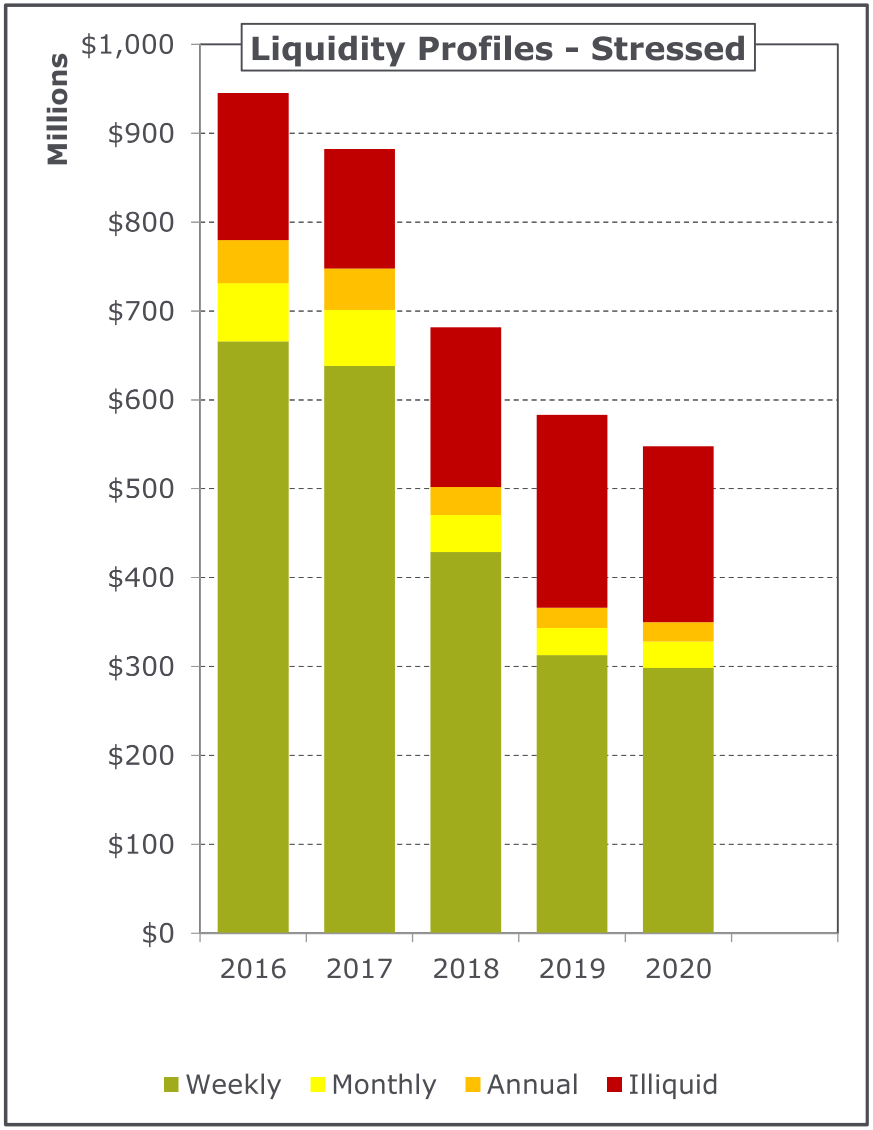
# Liquidity Profile Comparison – Normal Contribution Scenario



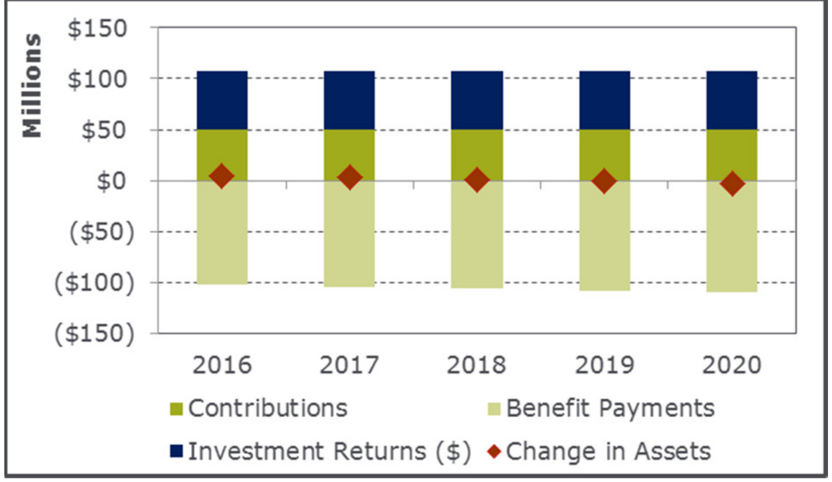
# Liquidity Profile Comparison – Normal Contribution Scenario



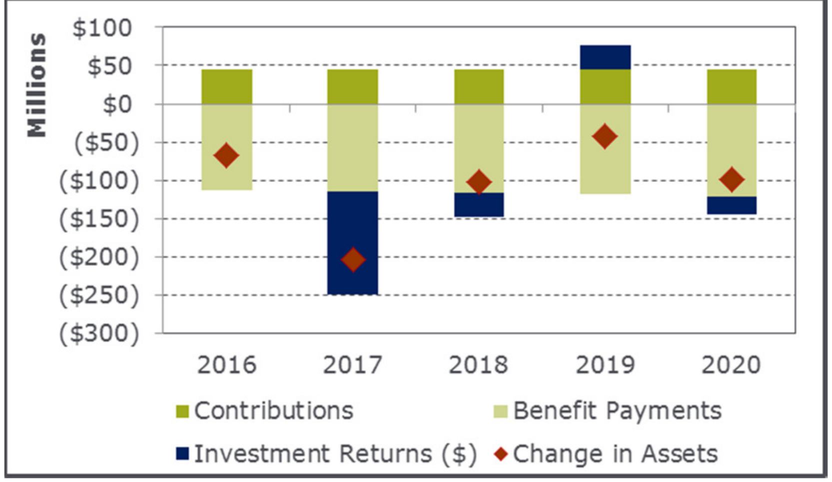



## Annual Change in Assets Attribution – Normal Contribution Scenario

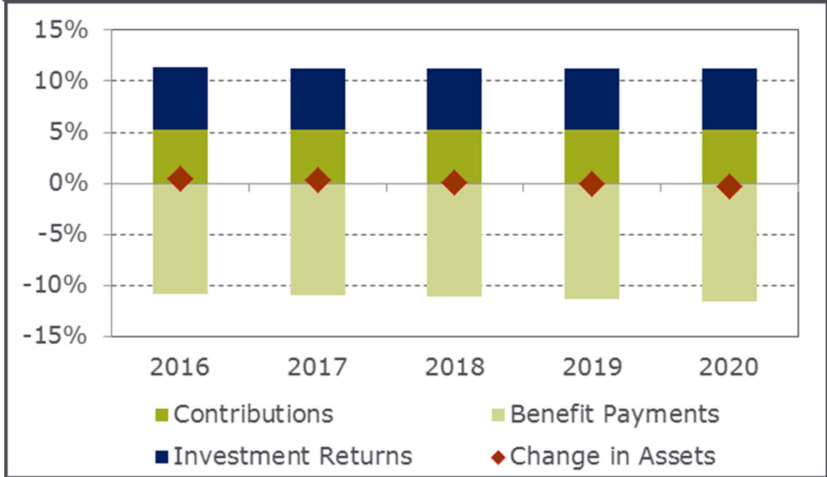
### Base Case – Dollar Basis



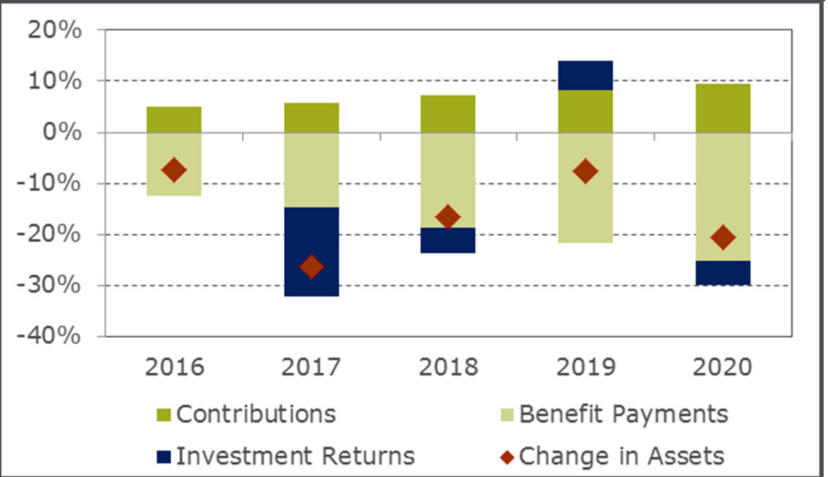

### Stressed Case – Dollar Basis




### Base Case – Percentage Basis

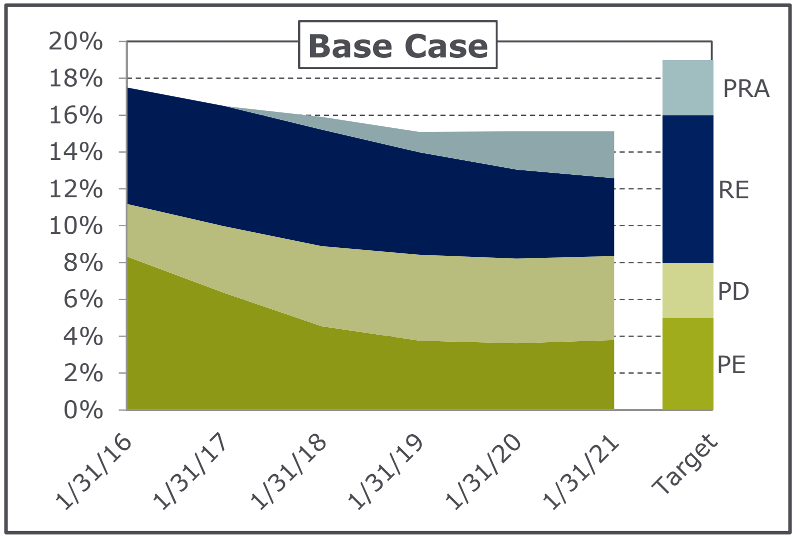


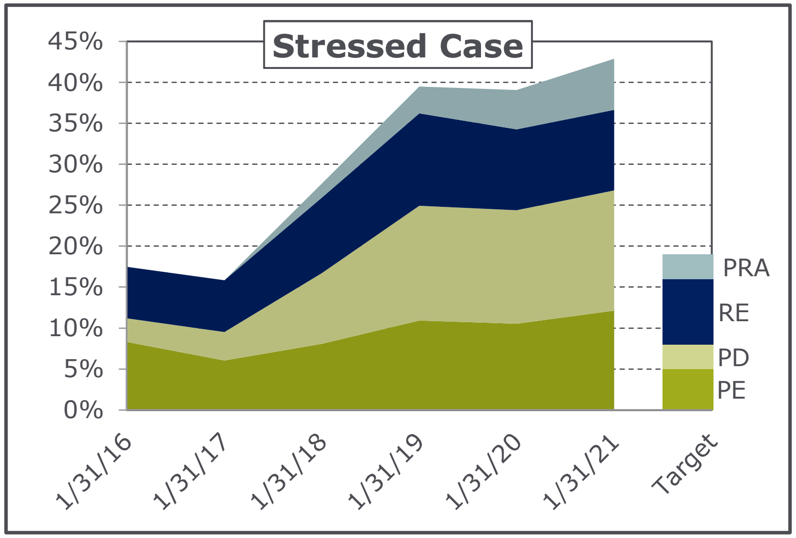

### Stressed Case – Percentage Basis



# Low Contribution Scenario

# Allocation to Illiquid Assets – Low Contribution Scenario

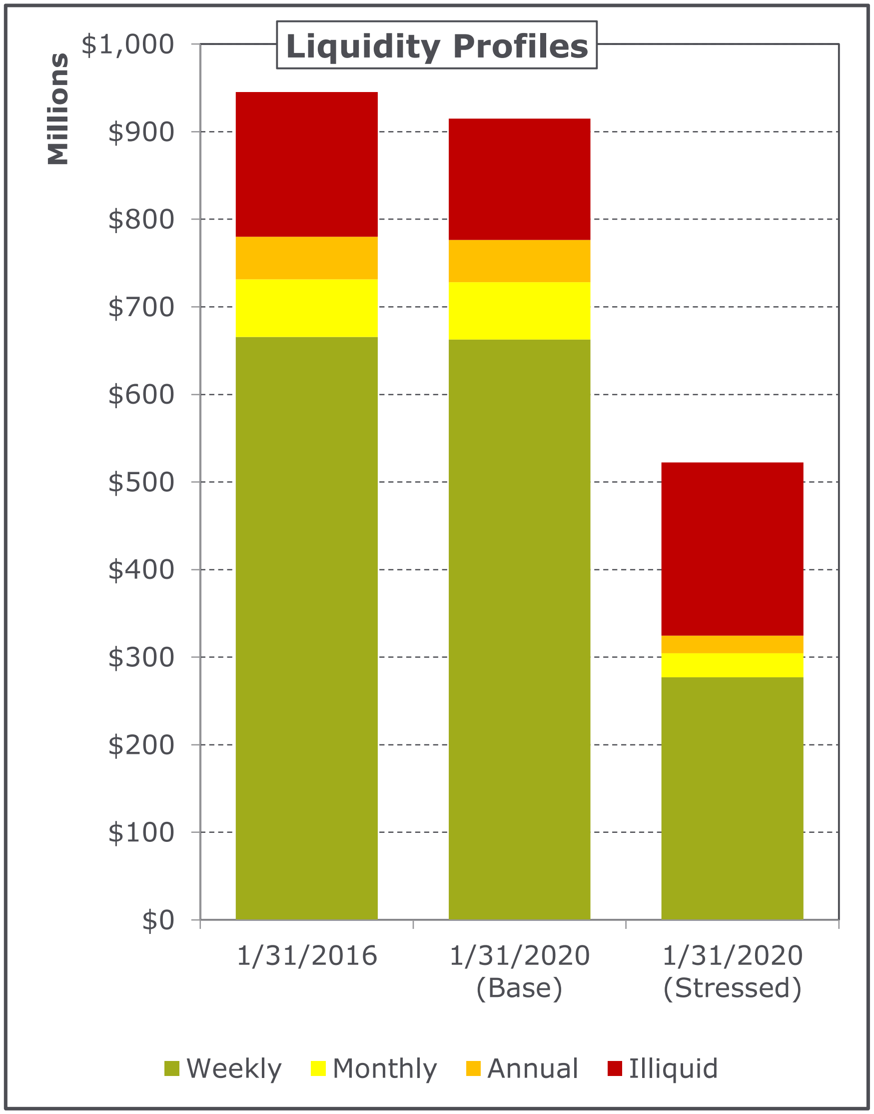


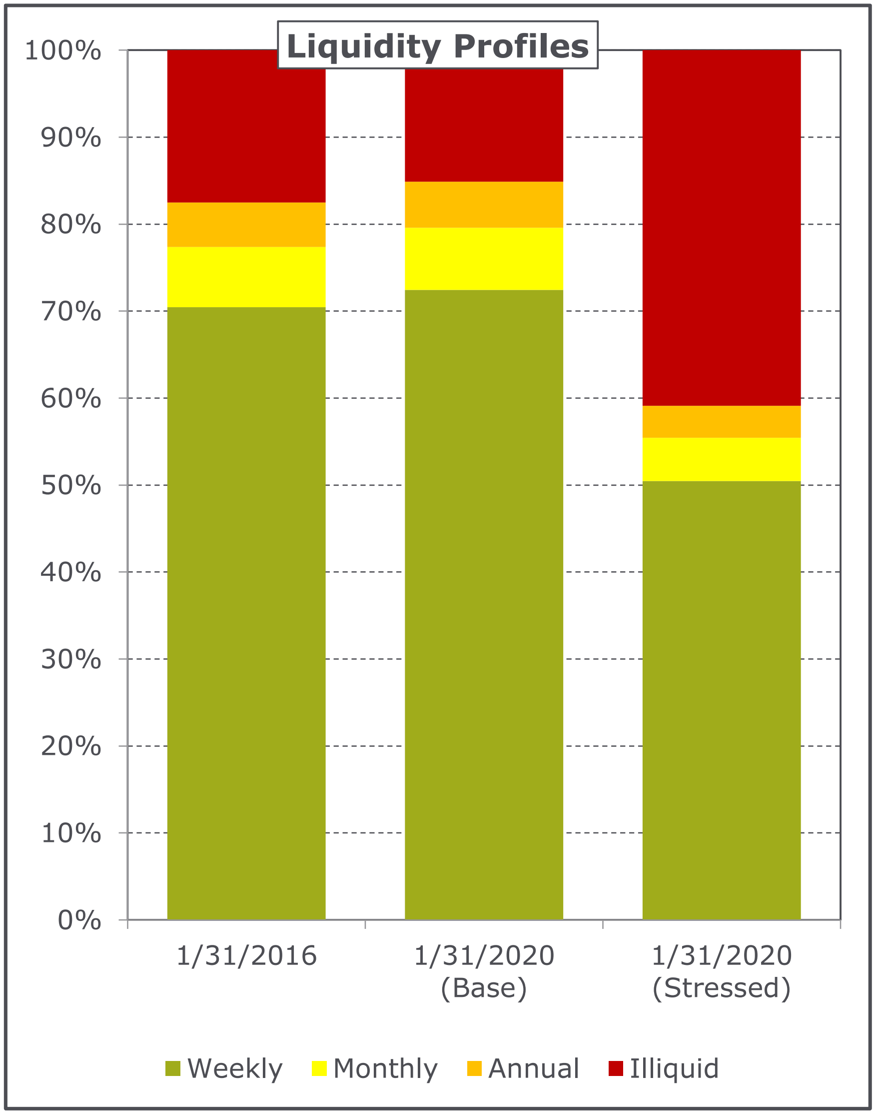




- **Expected future commitments keep allocations close but generally under targets in the base case**
  - Opportunity to allocate additional capital opportunistically to achieve targets

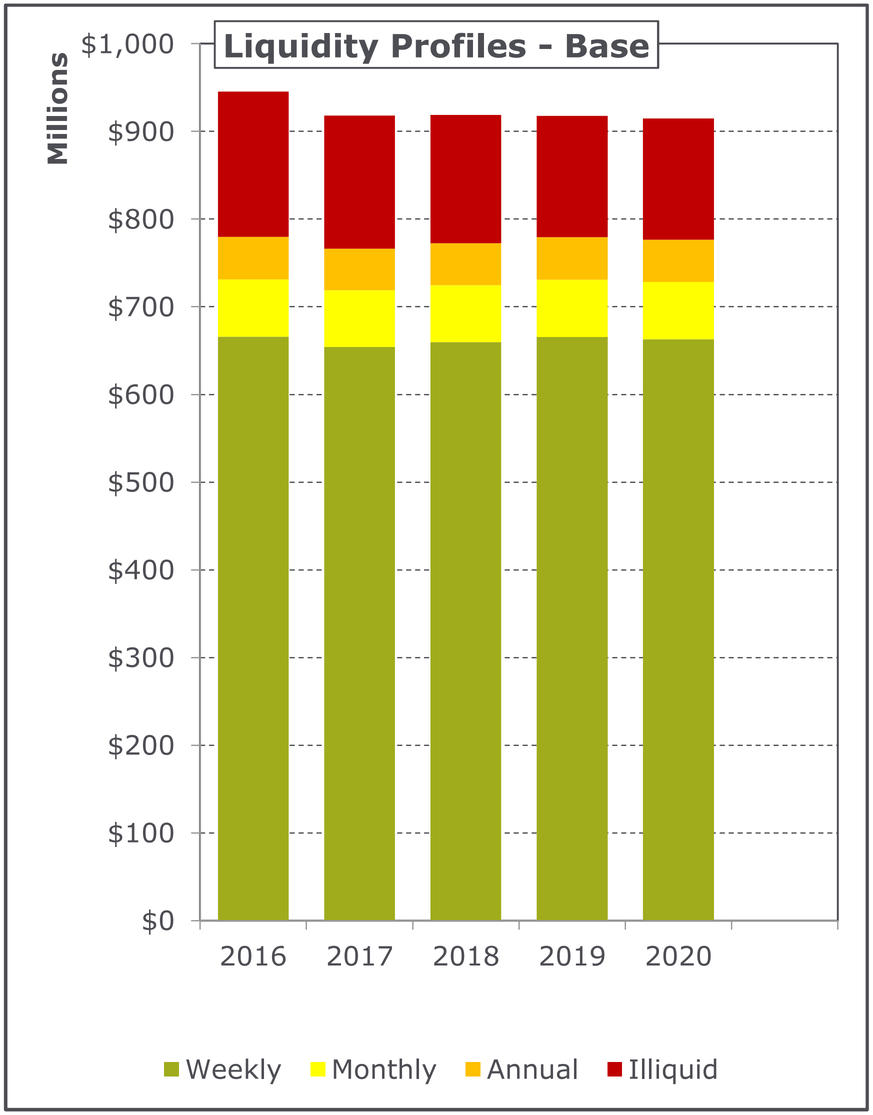
- **In the stressed case an increase in capital calls and a reduction in distributions combine with negative asset returns (denominator effect) to raise allocations to private markets well above targets**
  - Slowing the pace of future commitments could help mitigate this issue
  - Rise in illiquid allocation is slightly greater than in base case contribution scenario but not significantly so

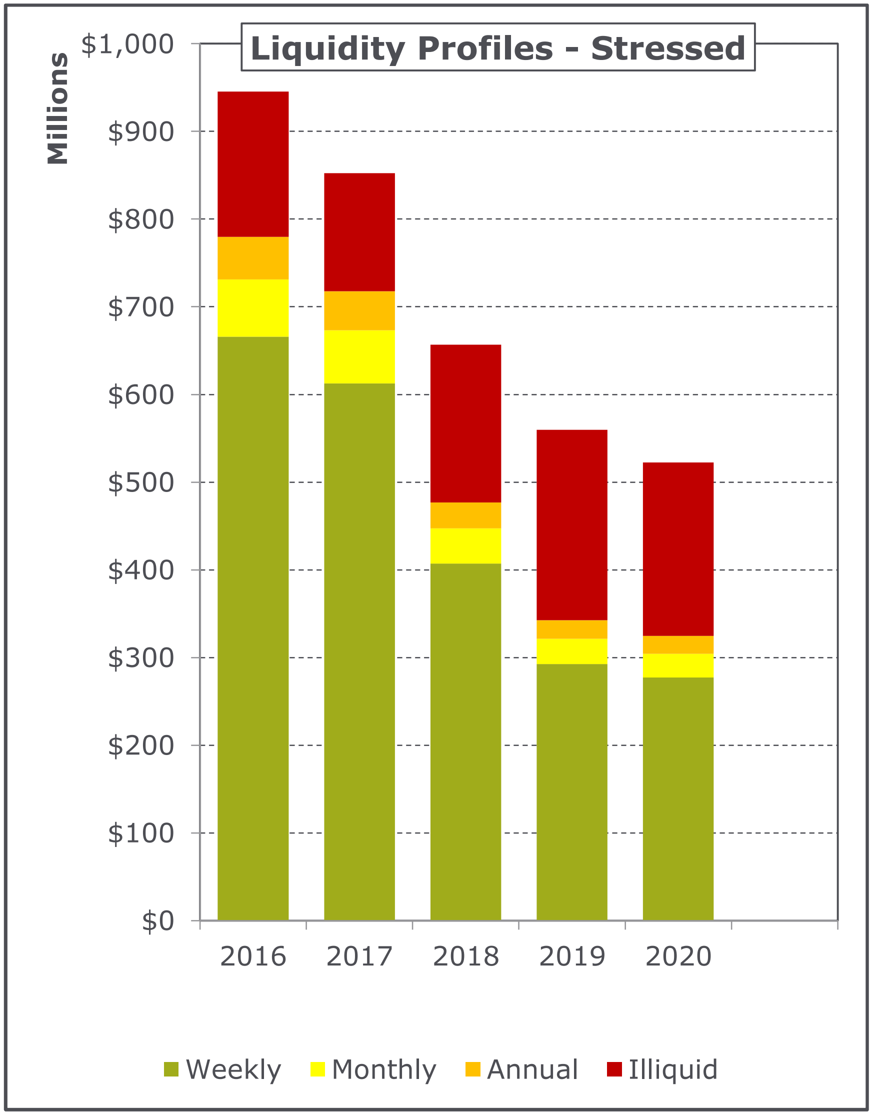
# Liquidity Profile Comparison – Low Contribution Scenario



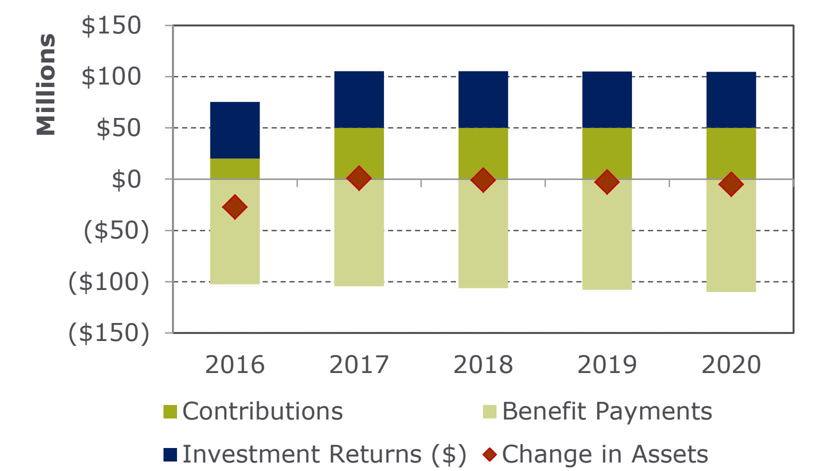
## Liquidity Profile Comparison – Low Contribution Scenario



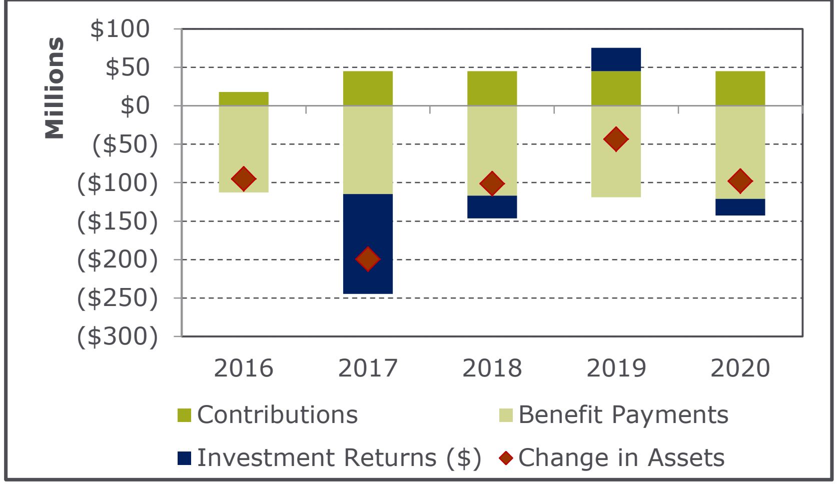



# Annual Change in Assets Attribution – Low Contribution Scenario

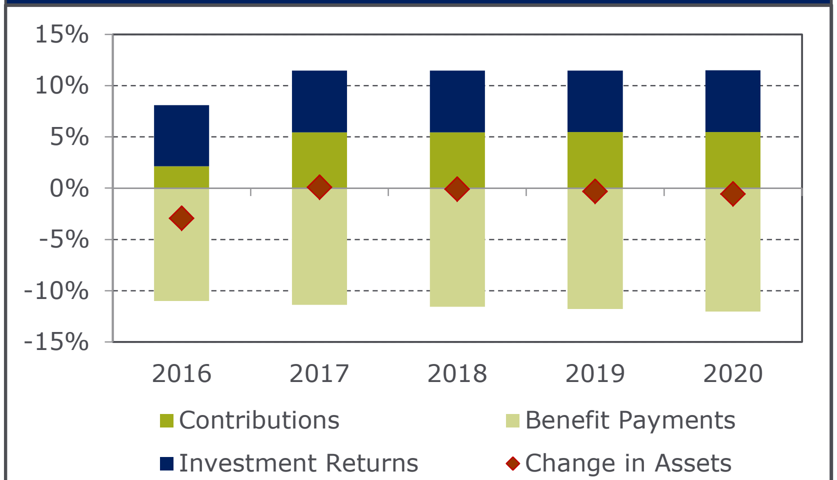
## Base Case – Dollar Basis



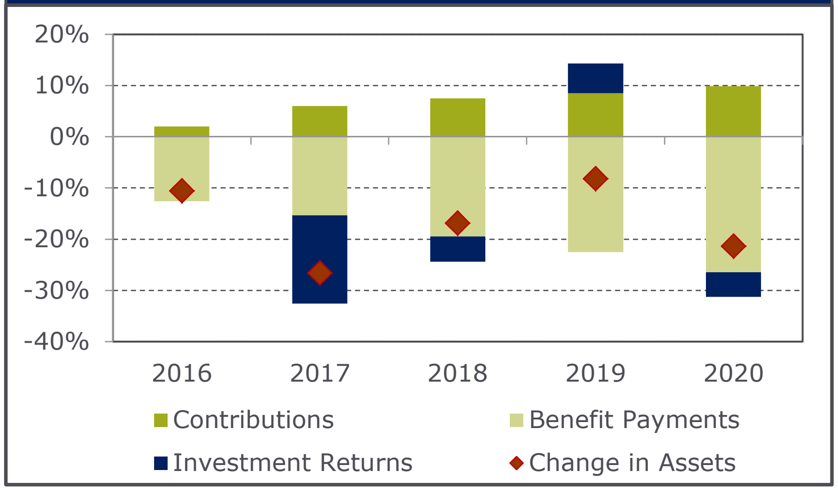

## Stressed Case – Dollar Basis




## Base Case – Percentage Basis

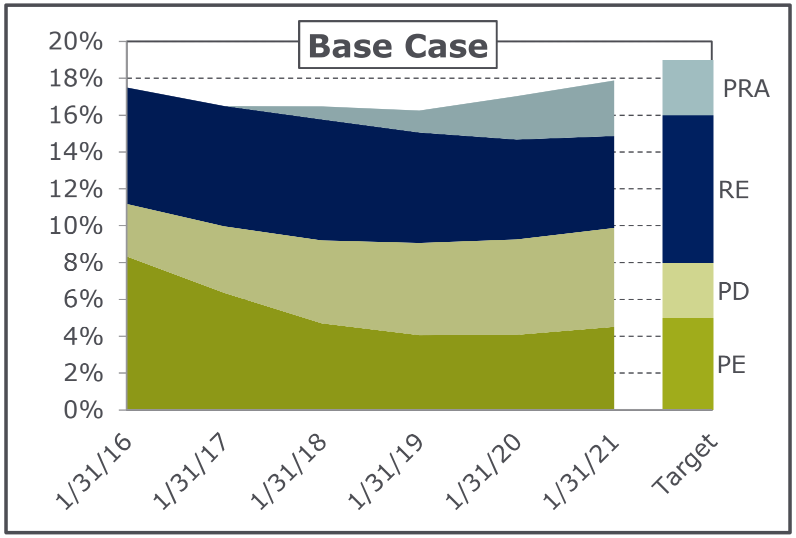


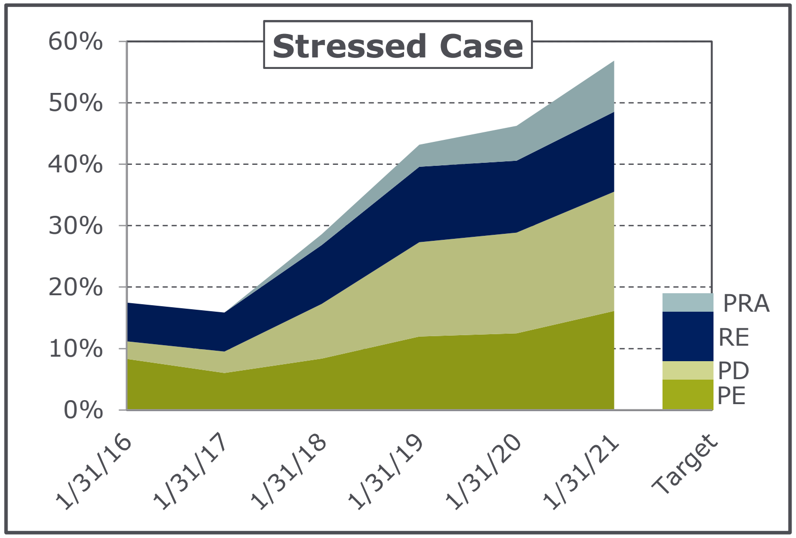

## Stressed Case – Percentage Basis



# Sustained Low Contribution Scenario

# Allocation to Illiquid Assets – Sustained Low Contribution Scenario

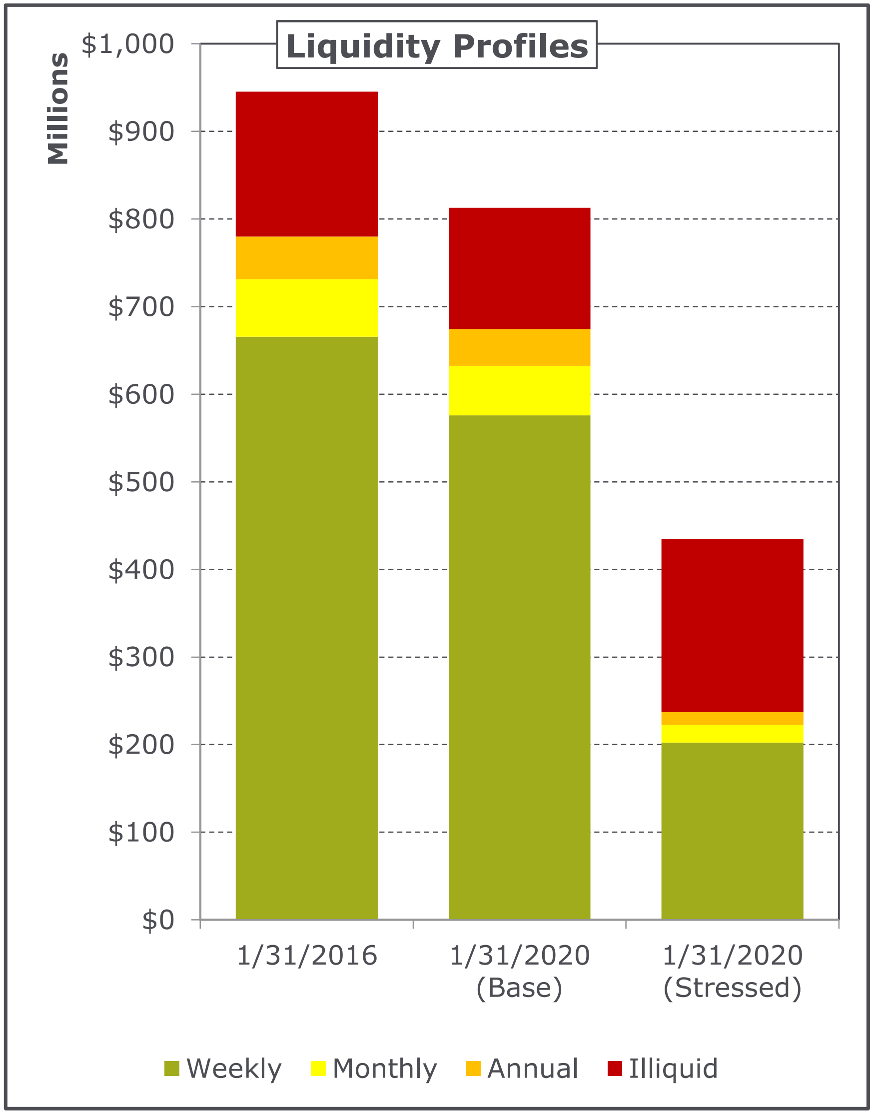


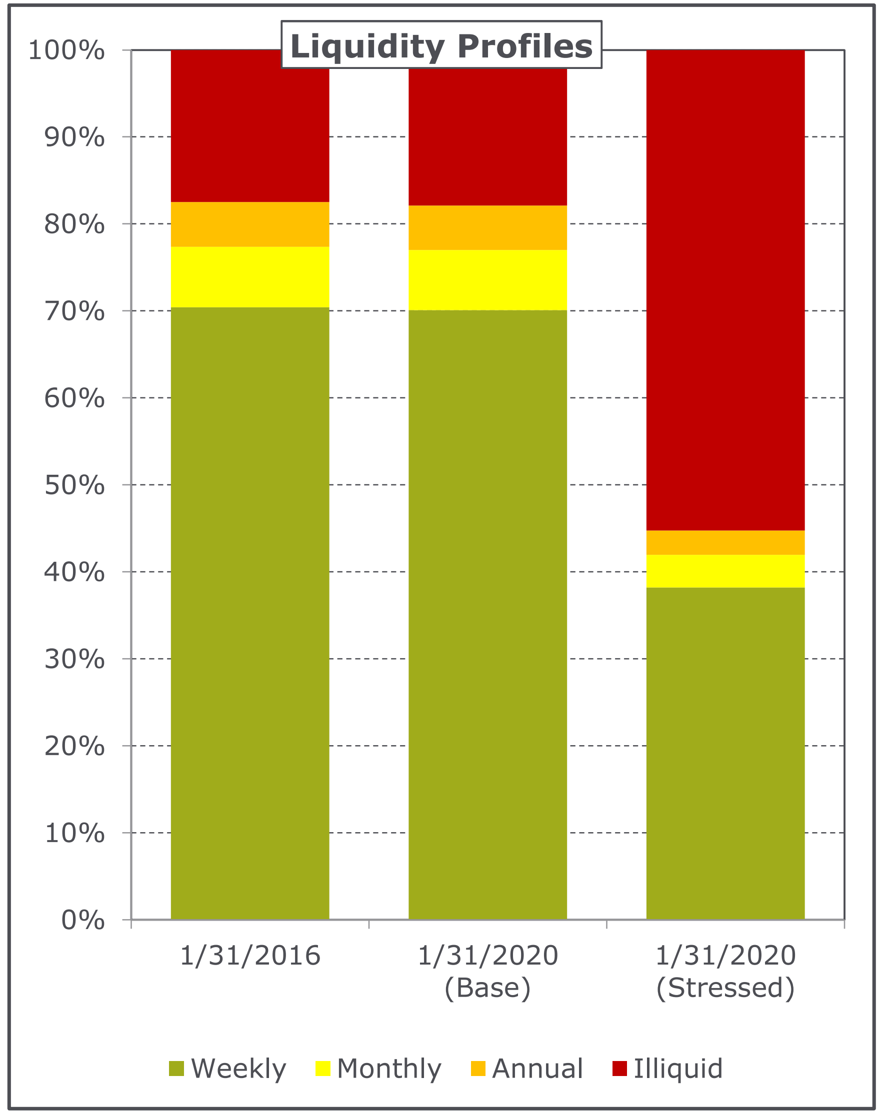




- **Expected future commitments keep allocations close but generally under targets in the base case**
  - Opportunity to allocate additional capital opportunistically to achieve targets

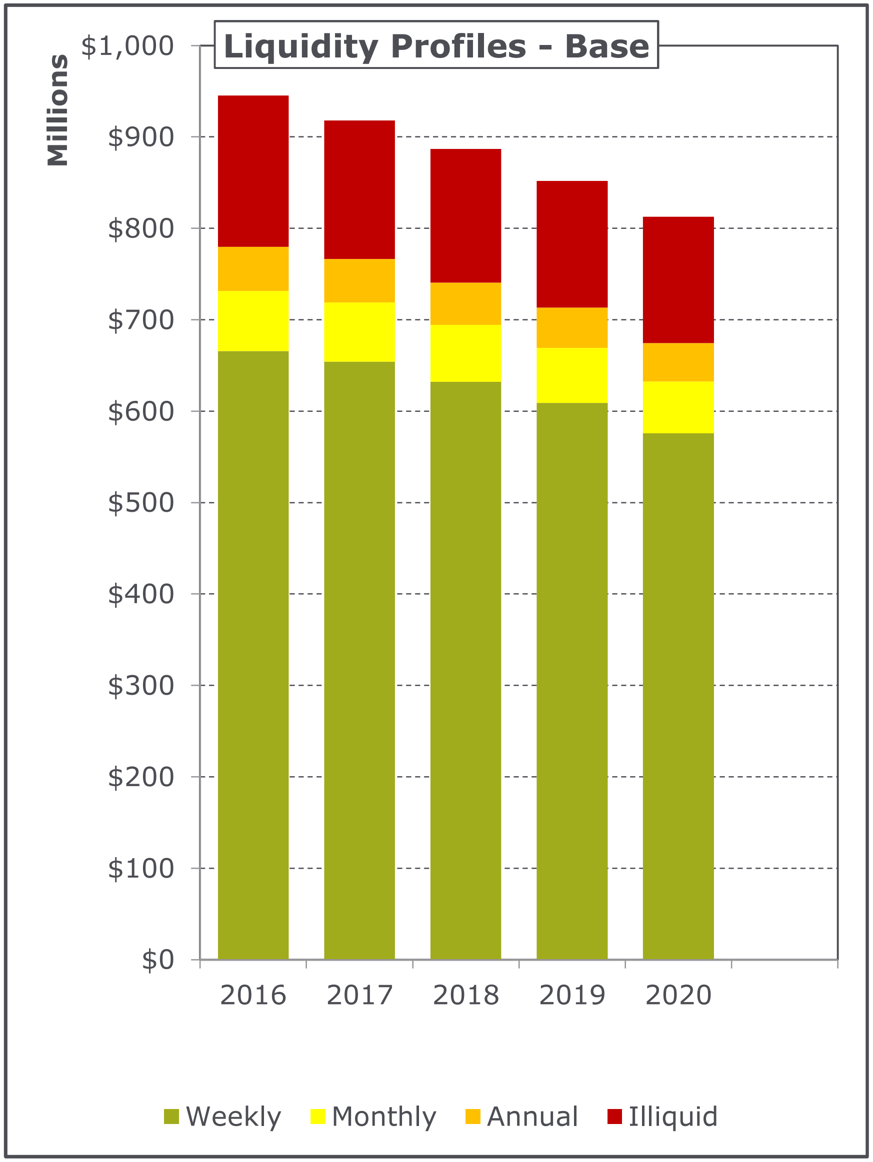
- **In the stressed case an increase in capital calls and a reduction in distributions combine with negative asset returns (denominator effect) to raise allocations to private markets well above targets**
  - Slowing the pace of future commitments could help mitigate this issue
  - Rise in illiquid allocation is significantly more extreme than in the base case contribution scenario and could threaten the viability of the plan

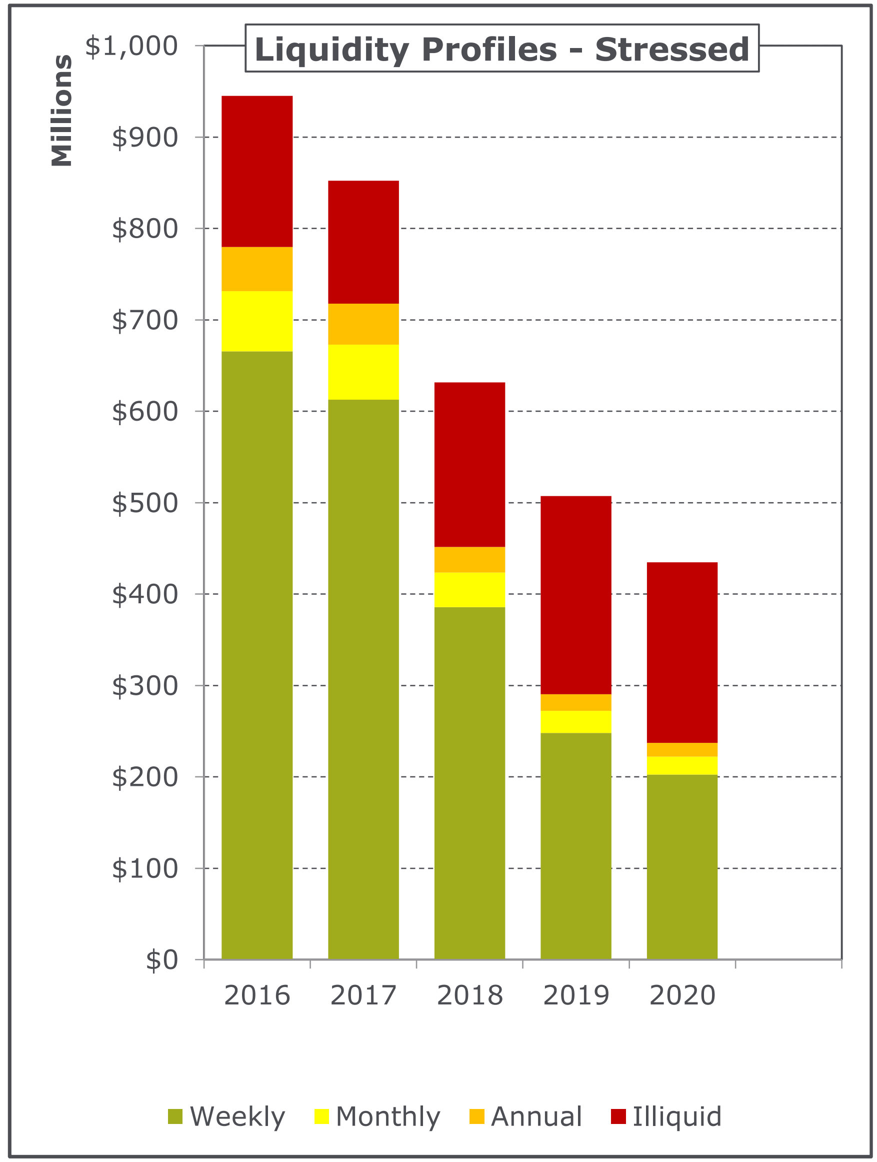
# Liquidity Profile Comparison – Sustained Low Contribution Scenario



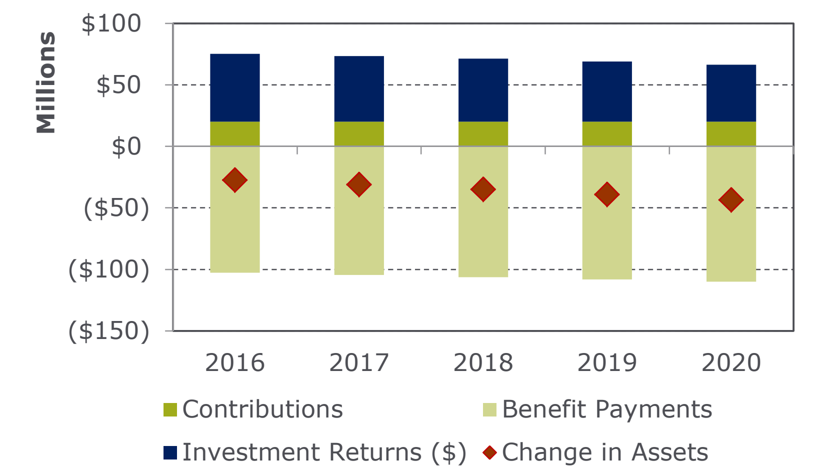
# Liquidity Profile Comparison – Sustained Low Contribution Scenario



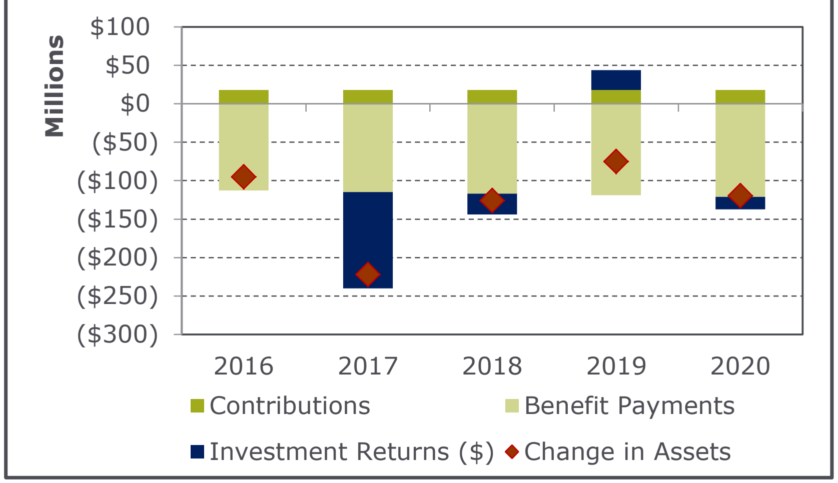



## Annual Change in Assets Attribution – Sustained Low Contribution Scenario

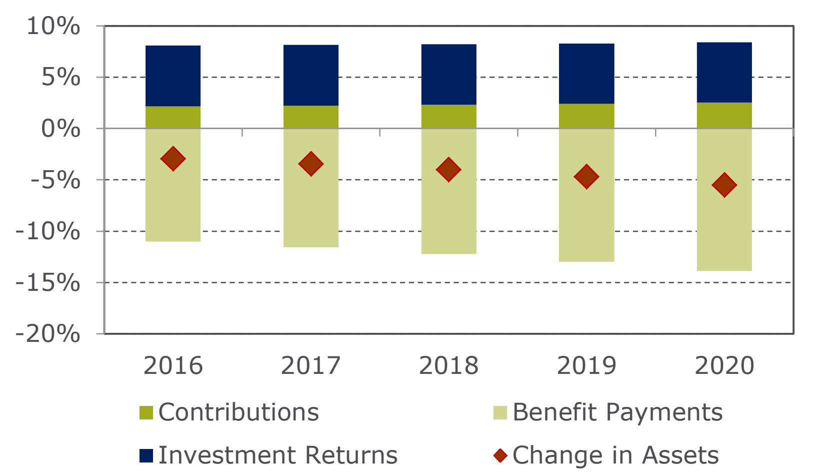
### Base Case – Dollar Basis



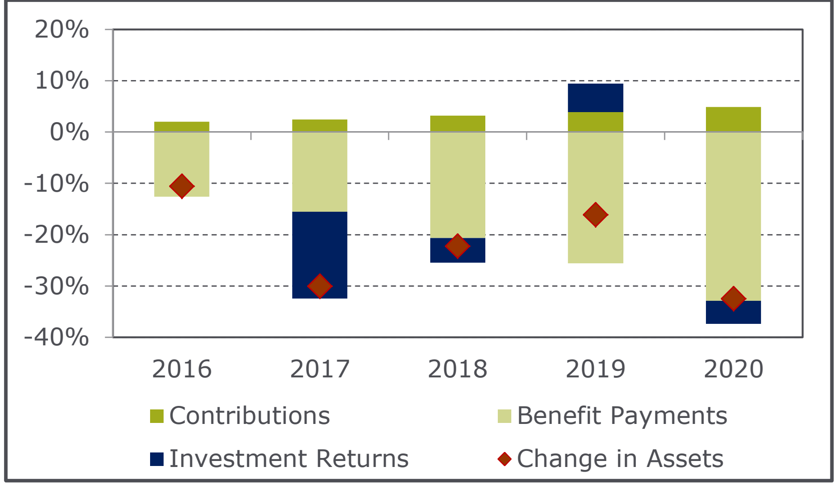

### Stressed Case – Dollar Basis




### Base Case – Percentage Basis



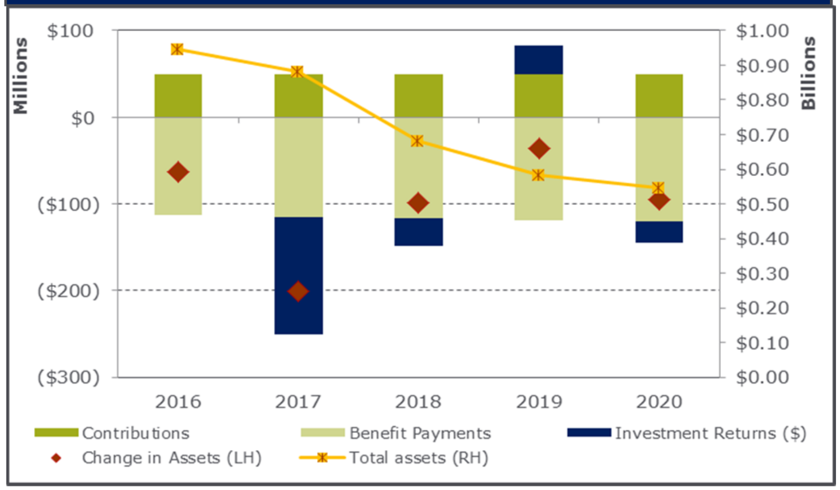

### Stressed Case – Percentage Basis



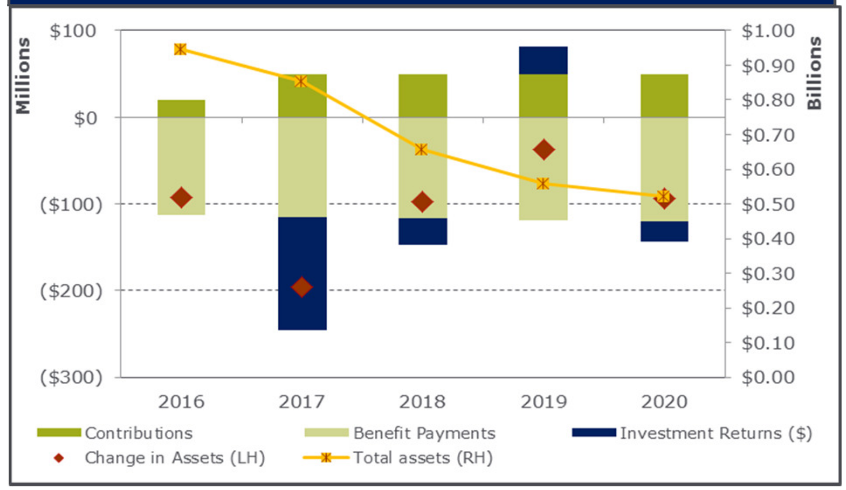
# Appendix

# Erosion of MERF's Asset Base – Stressed Case

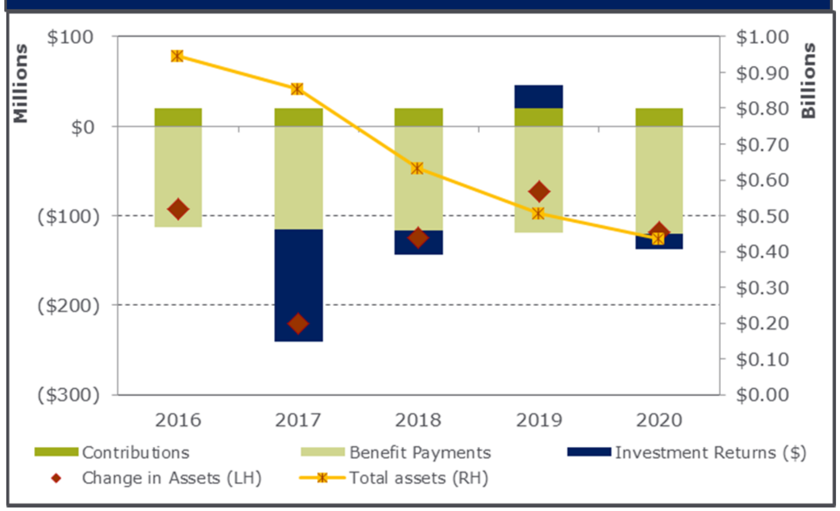
## Stressed Cased – Normal Contribution



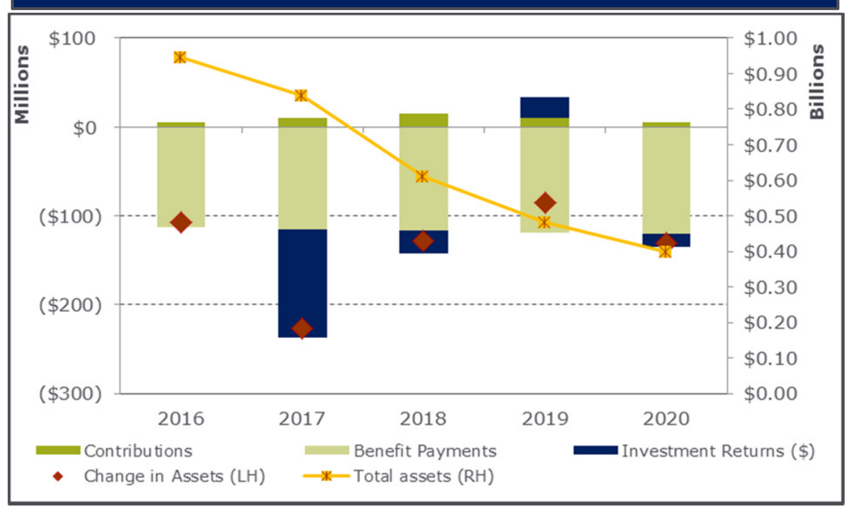

## Stressed Case – Low Contribution




## Stressed Case – Sustained Low Contribution

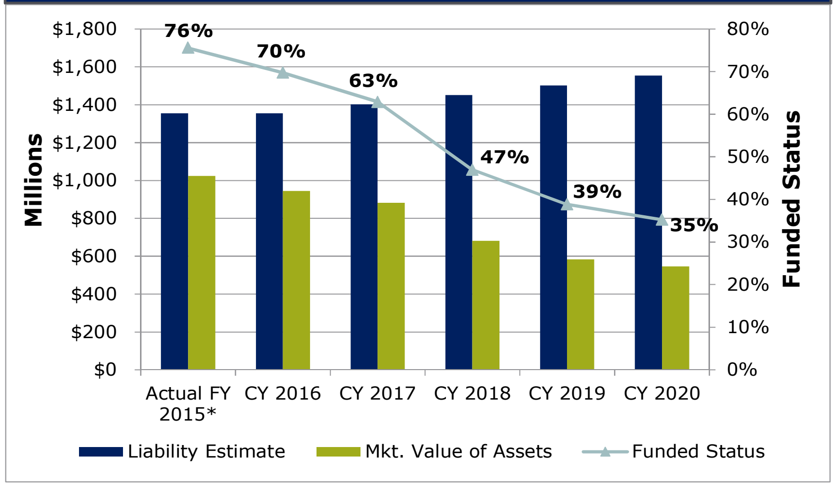



## Stressed Case – Bell Curve Contribution

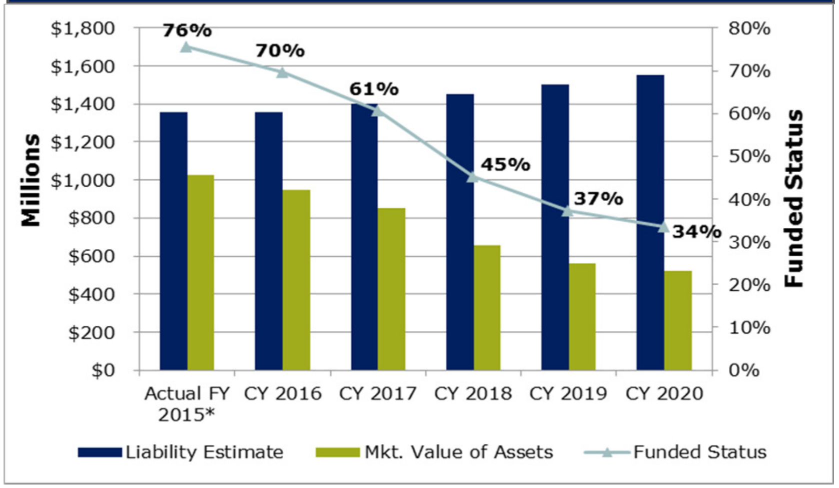


# Projected Decline in MERF's Funded Status – Stressed Case

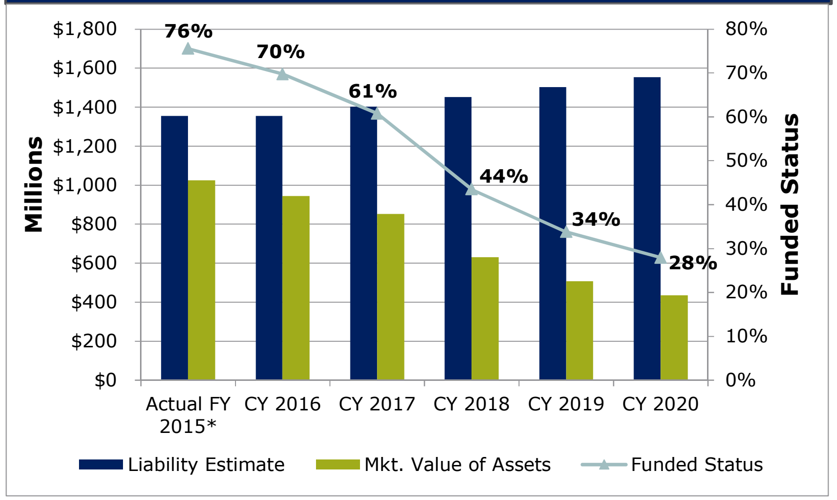
## Stressed Cased – Normal Contribution



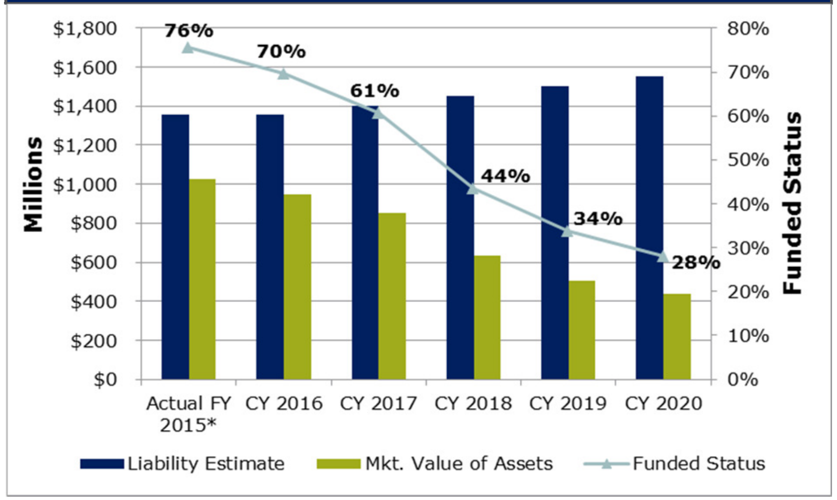

## Stressed Case – Low Contribution




## Stressed Case – Sustained Low Contribution




## Stressed Case – Bell Curve Contribution




*FY 2015 is based on the actual mkt. value and liability amount provided by MERF's actuary; the growth rate used for the estimated liability amount is based on NEPC's inflation assumption of 3.5%

## 2016 5-to-7 Year Return Forecasts

| Geometric Expected Return | | | |
|---|---|---|---|
| **Asset Class** | **2015** | **2016** | **2016-2015** |
| Cash | 1.75% | 1.50% | -0.25% |
| Treasuries | 1.75% | 1.75% | |
| IG Corp Credit | 3.25% | 3.75% | 0.50% |
| MBS | 2.00% | 2.00% | |
| *Core Bonds** | *2.30%* | *2.46%* | 0.16% |
| TIPS | 2.25% | 2.50% | 0.25% |
| High-Yield Bonds | 4.00% | 5.25% | 1.25% |
| Bank Loans | 4.50% | 5.50% | 1.00% |
| Global Bonds (Unhedged) | 1.00% | 1.00% | |
| Global Bonds (Hedged) | 1.13% | 1.09% | -0.04% |
| EMD External | 4.50% | 4.75% | 0.25% |
| EMD Local Currency | 5.50% | 6.50% | 1.00% |
| Large Cap Equities | 6.00% | 6.00% | |
| Small/Mid Cap Equities | 6.00% | 6.25% | 0.25% |
| Int'l Equities (Unhedged) | 7.00% | 7.25% | 0.25% |
| Int'l Equities (Hedged) | 7.39% | 7.57% | 0.18% |
| Emerging Int'l Equities | 9.00% | 9.75% | 0.75% |
| Private Equity | 8.50% | 8.50% | |
| Private Debt | 7.50% | 7.50% | |
| Private Real Assets | 8.00% | 8.25% | 0.25% |
| Real Estate | 6.50% | 6.50% | |
| Commodities | 5.25% | 4.50% | -0.75% |
| Hedge Funds | 5.75% | 5.75% | |

* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

# 2016 Volatility Forecasts

| Volatility | | | |
|---|---|---|---|
| **Asset Class** | **2015** | **2016** | **2016-2015** |
| Cash | 1.00% | 1.00% | |
| Treasuries | 5.50% | 5.50% | |
| IG Corp Credit | 7.50% | 7.50% | |
| MBS | 7.00% | 7.00% | |
| *Core Bonds** | *6.03%* | *6.03%* | |
| TIPS | 7.50% | 6.50% | -1.00% |
| High-Yield Bonds | 13.00% | 13.00% | |
| Bank Loans | 8.00% | 9.00% | 1.00% |
| Global Bonds (Unhedged) | 9.00% | 8.50% | -0.50% |
| Global Bonds (Hedged) | 5.00% | 5.00% | |
| EMD External | 12.00% | 13.00% | 1.00% |
| EMD Local Currency | 15.00% | 15.00% | |
| Large Cap Equities | 17.50% | 17.50% | |
| Small/Mid Cap Equities | 21.00% | 21.00% | |
| Int'l Equities (Unhedged) | 21.00% | 21.00% | |
| Int'l Equities (Hedged) | 17.50% | 18.00% | 0.50% |
| Emerging Int'l Equities | 26.00% | 27.00% | 1.00% |
| Private Equity | 27.00% | 23.00% | -4.00% |
| Private Debt | 17.00% | 15.00% | -2.00% |
| Private Real Assets | 23.00% | 20.00% | -3.00% |
| Real Estate | 15.00% | 15.00% | |
| Commodities | 18.00% | 19.00% | 1.00% |
| Hedge Funds | 9.00% | 9.00% | |

* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

# Information Disclaimer

- **Past performance is no guarantee of future results.**
- **The goal of this report is to provide a basis for substantiating asset allocation recommendations. The opinions presented herein represent the good faith views of NEPC as of the date of this report and are subject to change at any time.**
- **Information on market indices was provided by sources external to NEPC. While NEPC has exercised reasonable professional care in preparing this report, we cannot guarantee the accuracy of all source information contained within.**
- **All investments carry some level of risk. Diversification and other asset allocation techniques do not ensure profit or protect against losses.**
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**It is important that investors understand the following characteristics of non-traditional investment strategies including hedge funds and private equity:**

1. **Performance can be volatile and investors could lose all or a substantial portion of their investment**
2. **Leverage and other speculative practices may increase the risk of loss**
3. **Past performance may be revised due to the revaluation of investments**
4. **These investments can be illiquid, and investors may be subject to lock-ups or lengthy redemption terms**
5. **A secondary market may not be available for all funds, and any sales that occur may take place at a discount to value**
6. **These funds are not subject to the same regulatory requirements as registered investment vehicles**
7. **Managers may not be required to provide periodic pricing or valuation information to investors**
8. **These funds may have complex tax structures and delays in distributing important tax information**
9. **These funds often charge high fees**
10. **Investment agreements often give the manager authority to trade in securities, markets or currencies that are not within the manager's realm of expertise or contemplated investment strategy**